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ABSTRACT

Presented is a booklet containing scope and sequence charts for kindergarten and grades 1 to 6 science units. Overviews and lists of major concepts for units in the life, physical, and earth/space sciences are provided in tables for each grade level. Also presented are seven complete units, one for each grade level. Following a table of contents, each unit is divided into two parts. The first part, consisting of a single page, presents unit overview and lists of major concepts and materials needed. The second part presents, in separate columns, activity titles and lists of skills fostered (first column), description of corresponding activity (second column), and related information for teachers (third column). Topic areas include observing seasonal changes (kindergarten), rocks (grade 1), night and day (grade 2), water cycle (grade 3), rocks and minerals (grade 4), earth's changing surface (grade 5), and the universe (grade 6). (JN)

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ED237357

SCOPE and SEQUENCE

Life Sciences

Physical Sciences

Earth and Space Sciences

A Summer Curriculum Development Project
Sponsored by the Cortland-Madison BOCES

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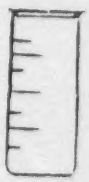

SE043570

Introduction

This booklet contains a Scope and Sequence Chart for Science K-6, overviews, and major concepts for each unit.

Some units contained in the Scope and Sequence are pilot units developed by the New York State Education Department (SED) from 1980 to present. These nineteen, hands-on state units (seventeen of which appear in the Scope and Sequence Chart) have been trial tested by people across the state. More than 275 people have been involved in this testing. This group included teachers, principals, science supervisors, curriculum administrators, BOCES administrators, and college professors. Constant feedback has been gained from meetings throughout the state. Communications between the test centers, S.E.D. and the Monroe #2-Orleans BOCES has helped the state to set a target date of September 1983 for the K-6 State curriculum and program.

These seventeen units may be obtained from your representatives on this curriculum project. These units are denoted by and asterisk (*) on the Scope and Sequence Chart. At present, the Monroe #2-Orleans BOCES is the sole distributor for the kits that were used for testing.

The remainder of the Scope and Sequence Chart, overviews and major concepts were developed by the curriculum writers from Cincinnatus and DeRutyer Central Schools during the summer of 1982. It was a concern that there were gaps in the state units particularly in the areas of Earth and Space Science.

This third strand was added at this time as were several units in the Life and Physical Science strands. Also, units on Comparing Animals (Grade 1), Machines (Grade 4), Energy (Grade 5) and Microbiology (Grade 6) were developed by the committee.

During the summer of 1983, representatives from Cincinnatus, Cortland, DeRuyter, Homer and McGraw continued to develop more units of study (those units denoted by (1983))on the Scope and Sequence Chart.

Therefore, the curriculum writers feel that the Scope and Sequence Chart that is contained in this booklet is a comprehensive K-6 Science Curriculum.

This curriculum project was held during the summer of 1982 under the auspices of the Cortland-Madison BOCES. The committee was made up of the following component district representatives:

1982		1983	
John Baden, Coordinator	Homer	John Baden, Coordinator	Homer
Phyllis Avery	DeRuyter	Phyllis Avery	DeRuyter
Dave Ball	DeRuyter	Fay Holler	Cortland
Joanne Holcomb	Cincinnatus	Donna Marsh	Cincinnatus
Steve Yager	Cincinnatus	John Pinto	McGraw

	OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
K.	*Observing Classroom Plants and Animals	Sunshine, Shadows and Silhouettes Waterplay	Observing Seasonal Changes (1983)
1.	*From Seed to Plants Comparing Animals	*Properties	Rocks (1983) Weather and Seasons I
2.	*Plant and Animal Life Cycles	*Measuring	Weather and Seasons II Night and Day (1983)
3.	*Butterflies and Moths	*Sound *Buoyancy	Water Cycle (1983) Oceans (1983)
4.	Communities (*Crayfish) Sunlight and Green Plants	Machines *Powders and Crystals	Rocks, Minerals (1983) Solar Systems
5.	*Pond Life *Meet the Creatures	*Electrical Circuits Energy	Earth's Changing Surface (1983)
6.	Plant and Animal Environments Microbiology	*Electromagnetism *Looking at Liquids	Universe (1983) Weather and Climates

* SEE INTRODUCTION

LIFE SCIENCES

Observing Classroom Plants and Animals

Overview: Students will be exposed to a variety of growing plants in the classroom. Students will observe plants growing. Students will participate in the planting and care of plants. Students will be exposed to, observe and participate in the care of animals.

Major Concepts

1. Plants have needs in order to survive.
2. Plants show growth.
3. The parts of plants have functions which enable the plants to live.
4. Animals have needs in order to survive.

PHYSICAL SCIENCES

Sunshine, Shadows and Silhouettes

Overview: Through the use of the skills of observing, communicating and manipulating, students will investigate the properties of Sunshine, Shadows and Silhouettes.

Major Concepts

1. Some objects are sources of light.
2. An object can interact with light by reflecting the light that falls on it.
3. An object can interact with light by allowing light to pass through it.
4. When an object blocks the path of light a shadow can be cast in the space where the light would have gone or upon the surface the light would have fallen.
5. The shape, size and location of a shadow depend on:
   a. the direction from which the light comes.
   b. the shape of the object which blocks the light.
   c. the position of the surface on which the shadow is cast.
6. The surface of an object directly facing a light source is the only part illuminated by it.

EARTH AND SPACE SCIENCE

Observing Seasonal Changes

Overview: Students will observe and discuss the various physical changes of the four seasons.

Major Concepts

1. Plants change through the four seasons.
2. Animal activity changes with the the seasons.
3. Weather changes through the four seasons.

GRADE ONE

LIFE SCIENCES

From Seed to Plant

Overview: Students will classify seeds by properties, plant seeds, care for plants, observe and record plant growth and participate in classroom projects.

Major Concepts

1. The parts of plants have functions which enable the plant to live.
2. The growth and development of a plant go through stages during the life span of the plant.
3. Parts of some plants change to meet the needs of the plant.
4. Plants are distinguished from each other by their properties.
5. Plants need proper care.

PHYSICAL SCIENCES

Properties

Overview: Through the use of the skills of observing, classifying and communicating, students will investigate the properties of objects. Students will observe and describe objects by their color, shape, texture, size, weight and ability to sink or float. Students will observe that objects can exist in different forms and that solids, liquids and gases are objects.

Major Concepts

1. Objects are distinguished from each other by their properties.
2. The materials from which objects are made affect their properties.
3. Objects can change form without changing all their properties.
4. Objects are solids, liquids, or or gases.
5. Some objects fall through a (sink) while others are supported by it (float). Floating or sinking depends upon properties of objects.

EARTH AND SPACE SCIENCE

Rocks

Overview: Students will predict how their senses of sight and touch help them learn about rocks, determine where rocks are found and observe the properties of rocks through the senses.

Major Concepts

1. Rocks are found most everywhere and their properties can be observed easily through the senses.
2. Rocks have practical and leisure time uses.

LIFE SCIENCES

Comparing Animals

Overview Students will become aware of the differences and similarities in animals.

Major Concepts

1. Animals differ in size, shape, color, and body covering.
2. Animals move in many different ways.
3. Animals live in many different places.
4. All animals need food, water and air.
5. Some animals eat only plants, some eat smaller animals that eat plants, others eat both plants and animals.

PHYSICAL SCIENCES

EARTH AND SPACE SCIENCE

Weather and Seasons I

Overview Students will learn to observe and describe the weather.

Major Concerpt

1. Air is all around us and many of its properties can be observed.
2. Weather is the state of the atmosphere at any given time at a certain place.
3. Sunshine, clouds, rain, fog, snow, and wind can be observed.
4. Weather conditions affect human activities.

GRADE TWO

LIFE SCIENCES

Plant and Animal Life Cycles

Overview Students raise their own plants from seeds. They also raise their own fruit flies and mealworms. Students will observe and collect data on plant and animal life cycles, stages of growth, and biotic potential.

Major Concepts

1. Parts of plants have functions which enable the plant to live.
2. Plants are distinguished from each other by their properties.
3. Growth and development of a plant go through stages during the life cycle of the plant.
4. Seeds have characteristics which enable the plant to develop into a new plant.
5. Plants have the potential to produce numerous offspring.
6. Animals can be classified as amphibians, reptiles, birds, fish, and mammals.
7. Life is a cycle which includes birth, growth, and death.

PHYSICAL SCIENCES

Measuring

Overview Students will use balances and non-standard units of measurement to compare qualities of objects in terms of weight, length, capacity and area.

Major Concepts

1. Objects are measurable.
2. Objects may or may not be in balance depending on the location of the support.

EARTH AND SPACE SCIENCE

Weather and Seasons II

Overview Students will identify the elements that determine weather, measure air temperature observe the movement of air as wind and generalize that different kinds and amounts of precipitation vary according to geography.

Major Concepts

1. Various instruments are used to weather elements.
2. Clouds are classified according to their appearance and composition.
3. Weather conditions may vary in different parts of the world.

Night and Day

Overview Students will be able to describe the rotation of the Earth (by experimentation) and demonstrate and compare the positions of the Sun and Earth during day and night.

Major Concepts

1. The rotation of the Earth causes day and night.
2. One side of the Earth has day while the other side has night.
3. The Earth rotates on its axis once every 24 hours.

GRADE THREE

LIFE SCIENCES

Butterflies and Moths

Overview This unit provides students with the opportunity to observe the life cycle of butterflies and moths. Students will learn some of the similarities and differences in the body structures of butterflies and moths. Humane treatment of animals should be stressed throughout this unit.

Major Concepts

1. The parts of animals have functions which enable the animal to live.
2. Animals have the potential to produce numerous offspring.
3. Some animals respond to seasonal changes.
4. The growth and development of an animal goes through stages during the life cycle of the animal.
5. The young animals of a new generation grow as a result of existing in hospitable conditions.
6. Population size at any given time may depend upon biotic potential and environmental conditions other than
7. Amimals behavior is a result of a response to a stimulus.

PHYSICAL SCIENCES

Sound

Overview Using simple materials students investigate many basic sound making devices. Students begin to find out the relation between objects, the sounds they produce, and the actions necessary to produce and change those sounds. Through experimenting, students discover the conditions necessary to produce sounds with various materials. They explore the ways in which the pitch and the loudness of sounds can be affected by the physical characteristics of the materials and the way they are manipulated.

Major Concepts

1. Energy can exist in one of several forms including sound.
2. Energy can move through materials and through space.
3. The amount of energy at a given location can vary.
4. Sound can be reflected from an object causing an echo.
5. Sound can be absorbed by some objects.
6. Sound is caused by vibrations of an object.

EARTH AND SPACE SCIENCE

Water Cycle

Overview Students will understand that water is a colorless, odorless, tasteless substance that is found in all areas of world. It covers a major portion of the earth's surface and the phase of water continually changes.

Major Concepts

1. Water is found and stored on Earth in solids, liquids, and gas phase.
2. Evaporation, condensation, precipitation, collection and storage are processes of the water phase change and movement.
3. The water cycle consists of phrase changes in an endless and recurring process.

LIFE SCIENCES

PHYSICAL SCIENCES

Buoyancy

Overview Students will be informally introduced to the concept of buoyancy by providing them with an opportunity to plan and construct their own floating containers. Students experiment with a investigate the variables that affect the flotation of boats they construct.

Major Concepts

1. The properties of a material are determined by its form.
2. The materials from which objects are made affect their properties.
3. Some objects fall through a liquid (sink) while others are supported by it (float). Floating or sinking depends upon properties.

EARTH AND SPACE SCIENCE

Rocks, Minerals and Soils

Overview Students will observe that rocks are earth materials made of small particles called minerals and soils are made of crumpled pieces of rock and decayed plants and animals.

Major Concepts

1. Rocks are natural earth materials composed of minerals.
2. Rocks are constantly undergoing change caused by their environment.
3. Soils have different layers that can be identified.
4. There are different types of soils (clay, sand, silt, etc.).

GRADE FOUR

LIFE SCIENCES

Communities (Crayfish)

Overview This unit provides the opportunity for students to observe the structure and behavior of crayfish. Students will identify physical characteristics, reaction to stimuli, feeding habits, territorial behavior and measure the holding strength and weight of crayfish.

Major Concepts

1. The parts of animals have functions which enable the animals to live.
2. Animals thrive in a range of environmental conditions.
3. The behavior of animals change when environmental conditions change.
4. Animals obtain energy in various forms from the environment.
5. Animal behavior is a result of a response to stimulus.

PHYSICAL SCIENCES

Machines

Overview Students will become aware of simple machines and the part they play in our everyday lives.

Major Concepts

1. Work is done when a force moves an object.
2. A force is a push or pull.
3. There are six simple machines: lever, inclined plane, pulley, screw, wedge, and wheel and axle.
4. A complex machine is made of two or more simple machines.
5. Friction is a force that slows down moving objects.

EARTH AND SPACE SCIENCE

Oceans

Overview The student will name and locate the oceans of the earth, deduce that the oceans affect climate and identify where ocean life may occur.

Major Concepts

1. The oceans, which make up most of the earth's surface, are necessary to all life forms.
2. The ocean floor exhibits a variety of physical features.
3. Marine life is restricted to certain lize zones in the oceans.
4. The oceans provide a variety of food, energy and mineral resources.

LIFE SCIENCES

Sunlight and Green Plants

Overview Students will become aware of photosynthesis, reproduction, plant parts, and that plants are necessary for all life.

Major Concepts

1. Plants are an important form of life on earth.
2. Green plants produce their own food by photosynthesis.
3. Plants provide a source of food for animals.
4. Plants reproduce through a variety of methods.
5. All plants have certain requirements for growth.
6. Pollination is a vital process in the production of seeds.

PHYSICAL SCIENCES

Powders and Crystals

Overview Powders and crystals introduce students to chemical and and physical properties of familiar substances. Students perform experiments with chemical and physical reactions and chemical indicators. Students learn rules for eye protection, proper use of chemicals and match safety. Skills emphasized are observing, classifying, collecting, and interpreting data, communicating, manipulating, making decisions, and inferring.

Major Concepts

1. The properties of a material can be determined by observation.
2. Materials can be identified by chemical tests.
3. Chemical reactions may change the properties of
4. Results of testing the properties of a material may vary according to the of the material.
5. Unknown materials can be identified by comparing them to known materials tests.

EARTH AND SPACE SCIENCE

Solar System

Overview Students will realize the nine planets and the sun are only a part of our solar system.

Major Concepts

1. Our sun is an average star that is unique to us because of its close position.
2. The solar system is composed of the sun, planets, moons, asteroids meterors, comets, and empty space.
3. Life, as we know it, occurs only in relationship to planet earth.
4. The solar system remains in its orbital pattern because of the balance between gravitational attraction and the motion of its objects.

GRADE FIVE

LIFE SCIENCES

Pond Life

Overview Pond Life motivates students to investigate plants and animals living in ponds. Students learn how to use a microscope, make a slide, and observe the microcosm of life in a drop of pond water.

Major Concepts

1. Plants thrive in a range of environmental conditions.
2. Animals thrive in a range of environmental conditions.
3. The behavior of animals changes when environmental conditions change.
4. Animals obtain energy in various forms from the environment.
5. Particular types of plants and animals exist in particular environmental conditions.

PHYSICAL SCIENCES

Electrical Circuits

Overview This unit provides opportunities for students to carry out activities such as lighting a bulb, constructing a circuit, and testing for conductivity.

Major Concepts

1. Electrical energy can flow through circuits.
2. Energy can move through materials and through space.
3. Electricity flowing in a wire may cause the wire to become warm and glow.
4. The amount of energy at a given location can vary.

EARTH AND SPACE SCIENCE

Earth's Changing Surface

Overview Students will become aware that the Earth's surface is constantly in a state of change due to constructive destructive forces.

Major Concepts

1. The Earth is composed of three different layers: the crust, the mantle, and the core.
2. Geologists learn about the inner Earth by indirect observation when when they study earthquakes and and volcanoes.
4. Forces within the Earth forms different types of mountains.
5. Weathering is the breakdown of rock by physical or chemical means.
6. Lanscapes of the Earth are shaped and changed by both nature and humans.
7. The Earth's crust is organized into several plates that move or drift.

LIFE SCIENCES

Meet the Creatures

Overview "Meet the Creatures" stimulates students to ask questions about the observable behavior of an unfamiliar organism and then directs them to ways of finding answers for themselves. As students observe and experiment they learn some things about the process of scientific inquiry and about the sensory perception of the mealworm."

Major Concepts

1. Animals thrive in a range of environmental conditions.
2. The behavior of animals changes when environmental conditions change.
3. Animals behavior is a result of a response to a stimulus.

PHYSICAL SCIENCES

Energy

Overview The students will become aware that energy is available in many different forms.

Major Concepts

1. All things made up of atoms and molecules.
2. Energy is the ability to do work.
3. There are several types of energy such as heat, solar, geothermal, wind, nuclear, chemical and electrical.
4. Energy can be changed from one form to another.
5. Heat energy is transferred by conduction, convection or radiation.
6. Coal, petroleum, and natural gas are called fossil fuels and are sources of energy.

EARTH AND SPACE SCIENCE

GRADE SIX

LIFE SCIENCES

Plant and Animal Environments

Overview Students will become aware that every living thing is affected by its environment. Each organism, in turn, exerts an influence on its environment.

Major Concepts

1. Plants thrive in a range of environmental conditions.
2. Plants change when environmental conditions change, enabling the plants to live.
3. Animals thrive in a range of environmental conditions.
4. The behavior of animals change when environmental conditions change.
5. Animal behavior is a result of a response to a stimulus.

Microbiology

Overview Students will become aware that there are living things that can only be seen through a microscope. These living things are known as microorganisms.

PHYSICAL SCIENCES

Electromagnetism

Overview Students can develop an understanding of the properties of magnets and the relationship between magnets and circuits.

Major Concepts

1. Electrical energy flowing in a wire produces a magnetic field around the wire.
2. The amount of energy at a given location can vary.
3. Energy can be transformed by interactions with matter.

Looking at Liquids

Overview Students will utilize the a variety of liquids.

EARTH AND SPACE SCIENCE

Universe

Overview Students will become aware of stars, constellations and galaxies. All the galaxies and the space they exists in is called the universe.

Major Concepts

1. Astronomy is the science that deals with the study of the universe.
2. Patterns of stars in the night sky are called constellations.
3. Stars differ in size, magnitude and and color.
4. Galaxies are major systems containing millions of stars.
5. The distance across and between galaxies are measured in light years.
6. Galaxies are classified according to shape (irregular, spiral or elliptical).
7. Our solar system is located in the milky way galaxy.

Weather and Climate

Overview Students will become aware of the study of weather and how weather affects climates.

LIFE SCIENCES

Major Concepts

1. Organisms which cannot be classified as either plants or animals belong to the protist kindgom.
2. Microorganisms are organisms which can be seen using a microscope.
3. Bacteria, protozoa, fungi, and viruses are considered to be members of the protist kingdom.
4. Microorganisms can be helpful and harmful.
5. Some microbes cause disease.
6. Antiseptics, antibodies, vaccines, antibiotics and disinfectants are used to control microbes.
7. Microorganisms have many of the same life processes and cycles as larger plants and animals.

PHYSICAL SCIENCES

Major Concepts

1. Liquids interact differently with various surfaces.
2. Pressure influences the rate of flow of liquid.
3. Forces are exerted by liquids.

EARTH AND SPACE SCIENCE

Major Concepts

1. Weather is the state of the atmosphere at any given time and it is defined by measurable properties such as pressure, temperature and moisture.
2. Climate is the average weather conditions at a particular location over a long period of time.
3. Weather and its changes affect all living things.
4. Certain topographical features such as mountain ranges and large bodies of water affect weather greatly.
5. Land areas of the earth heat and cool quickly; water areas heat and cool slowly.

OBSERVING SEASONAL CHANGES

Grade K

Table of Contents

How does the weather change through the four seasons?	1 - 2
How do seasonal changes affect the temperature?	3 - 5
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How does animal activity change through the seasons?	7
How does the Monarch butterfly change through the seasons?	8
How does the frog change through the seasons?	9
Activity Sheets	10 - 12

*Note - This unit progresses with the seasons of the year. Please take time to read the entire unit before starting.

Observing Seasonal Changes

Overview

Students will observe and discuss the various physical changes of the four seasons.

Major Concepts

1. Weather changes through the four seasons.
2. Plants change through the four seasons.
3. Animal activity changes with the seasons.

Materials

drawing paper	markers	caterpillar or chrysalis
crayons	milkweed	*pattern for doll and clothes - appendix
bulletin boards	hand lenses	color coded thermometer - p. 9
oaktag	frog's eggs	small thermometers
glass jar	pond water	Easy View Magnifier
styrofoam cups	lettuce or algae	

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
Activity Title: Observing Weather Changes Skills Observing Communicating Listening Speaking Comparing	How does the weather change through the four seasons? What did you wear to school this morning? Why? How does the weather change what you wear? Introduce Princess Summer-Fall-Winter-Spring. *Paper doll and clothes pattern are included in the appendix. Use the following clothes to dress the doll appropriately. bathing suit — boots sweater — hat jeans — raincoat umbrella — snowmobile suit Why would Princess Summer-Fall-Winter-Spring wear a bathing suit? etc. Which season of the year would she wear the bathing suit? etc. After discussing each season, temperature, precipitation, ask students to dress the Princess properly. Make a bulletin board by adding seasonal weather scenes around the Princess. Snowflakes - Winter Sun - Summer Dark Clouds - Fall Raindrops - Spring	Material Needed Oaktag Markers Pattern for doll and clothes Oral Vocabulary temperature snow rain sunshine warm cold hot More Ideas 1. Show filmstrips dealing with seasonal changes. 2. Keep a record of daily weather changes either on a calendar or separate chart. Record basic weather signs - sun, rain, snow, wind, etc.

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
	Evaluation At the end of the year, ask the students to dress the Princess correctly by naming a season.	More Ideas con't 3. Display picture sets of seasonal changes - Example - SVE study prints. 4. Reserve a bulletin board to show seasonal changes - Example - Princess Summer-Fall-Winter-Spring Summer-Fall-Winter-Spring

OUTLINE CONNECTION

Activity Title

Observing Temperature Changes

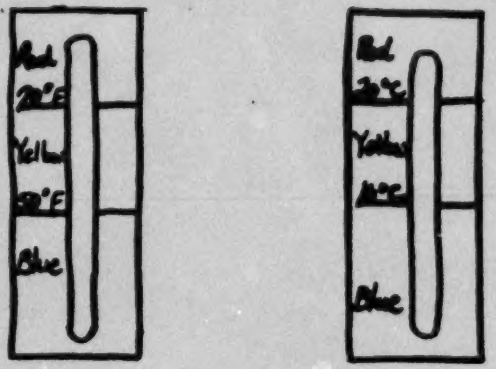
Skills

Observing
Communicating
Listening
Speaking
Comparing
Predicting

ACTIVITY

How do seasonal changes affect the temperature?

Use a color coded thermometer to compare average temperatures for each season. You can use either a commercially made or ribbon thermometer (see appendix). Follow one of these patterns to color-code your thermometer.



Fahrenheit or Celsius

3

INFORMATION FOR TEACHERS

Materials Needed

1 large color-coded thermometer
small thermometers for each table
3 color-coded cups for each table

Oral Vocabulary

hot
warm
cold
thermometer
Fahrenheit
Celsius

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
	Color code three cups per table - red, yellow, blue. In the red cup, place hot tap water. In the yellow cup, place cool tap water and in the blue cup, place ice water. Put small thermometers in one cup at a time. When does the line go up? When does the line go down? The teacher shows the results of each temperature reading from the cups on the large color coded thermometer. When the line goes up in the red area, what kind of temperatures do we have? What season of the year would have hot, "red" temperatures? Continue with each cup. As a follow-up activity for changes in weather and temperature, have copies of the evaluation sheet in the appendix dittoed off.	<u>More Ideas</u> 1. Keep a record of daily weather changes either on a calendar or separate chart. Record basic weather signs - sun, rain, snow, 2. Take a daily temperature reading and move the color-coded thermometer.

Ribbon Thermometer

You can make a chart of suitable size on a piece of cardboard about 30 x 40 cm, using a piece of red ribbon and a piece of white ribbon, each about 45 cm long. Draw the outline thermometer on the cardboard, and color or mark the areas with the code desired. Cut slots through the cardboard at the top and bottom of the drawing of the thermometer. Attach a red and a white piece of ribbon together with tape, or by sewing or stapling. Slip the ends of the ribbon through the slots, and tie them together loosely on the back of the cardboard.

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
Activity Title Observing Seasonal Changes in Trees Skills Observing Communicating Listening Speaking Predicting	How do trees change through the four seasons? In early September pick a pet tree for class. Visit the tree each season. Make observations about the tree noting changes as the seasons progress. What color are the leaves? How do the leaves feel? How do the other trees around look? What do you think the tree will look like at Christmas? etc. When the leaves are gone, is the tree dead? How do you know? Draw a picture of the tree for each season noting leaf color, absence of leaves, etc.	Materials Needed drawing paper crayons Oral Vocabulary trunk roots branch leaves Spring Summer Fall Winter Seasons More Ideas 1. Collect seasonal plants examples - cattails for Fall, pussywillows for Spring. 2. Take seasonal walks observing plants, animals and weather. 3. Compare the "pet" tree with an evergreen and perhaps a dead tree. 4. Show a filmstrip dealing with seasonal changes. 5. Display picture sets of seasonal changes. Example - SVE Study Prints.

OUTLINE CONNECTION

Activity Title

Observing Animal Activity through the Seasons

Skills

Observing
Communicating
Listening
Speaking

ACTIVITY

How does animal activity change through the seasons?

Make animal activity awareness charts to be added to throughout the year. As each child reports an activity, record his name, animal and observance on a seasonal chart.

Animals in Spring		
Name	Animal Seen	What was the animal doing?
Johnny	Robin	Collecting nesting materials
Mary	Rabbits	Babies were in a nest.

INFORMATION FOR TEACHERS

Materials Needed

bulletin board
oaktag

Oral Vocabulary

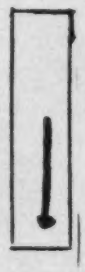
season
activity
Spring
Summer
Fall
Winter

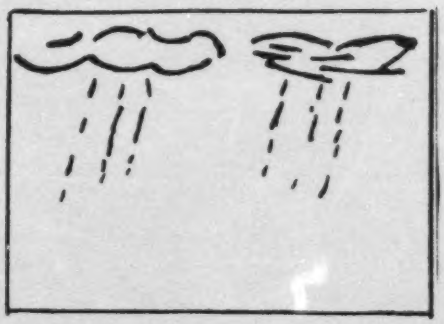
OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
Activity Title Observing Animal Activity Through the Seasons: Fall - Monaca Butterfly Skills Observing Communicating Listening Speaking Comparing Predicting	How does the Monarch butterfly change through the seasons? Try to bring in monarch caterpillars or a chrysalis on milkweed pods. Bring in at the very beginning of the year. Describe the caterpillar (only found at end of August or early September) or chrysalis. Is it alive? Predict what's going to happen. Check the caterpillar and/or chrysalis daily? What colors do you see? What other changes do you see? Examine each with a hand lens. When the butterfly appears, explain that the butterfly will migrate or fly away. Why? What would happen if the butterfly did not fly away? Can butterflies live in the winter?	Materials Needed caterpillar or chrysalis milkweed leaves hand lens *The chrysalis can be carefully removed from a woody stem and reglued to a pencil. Do not put in a covered jar as the butterfly could damage its wings. Oral Vocabulary Monarch butterfly caterpillar milkweed migrate winter More Ideas 1. Display study prints on the monarch. 2. Show a filmstrip.

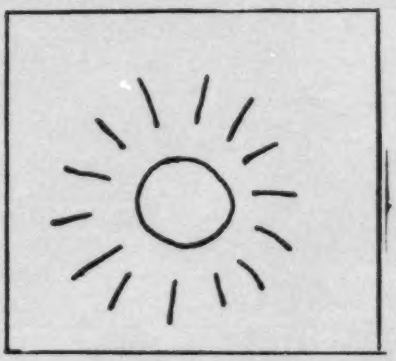
OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
Activity Title Observing Animal Activity Through the Seasons Spring - (Pollywogs) Skills Observing Communicating Listening Speaking Comparing Predicting	How does the frog change through the seasons? Try to bring in frog's eggs from a local pond the very first part of spring. Have the students examine the eggs with hand lenses or Easy View Magnifier. What do you think these are? What do you think these will become? After the pollywogs have hatched examine with the hand lens or Easy View Magnifier. What did you see? What changes do you see? Describe the changes over a period of time. What do you think these animals will become? What other changes will occur? Describe the frog. What do you think the frog will do in the winter.	Materials Needed frog's eggs *pond water only glass jar hand lens Easy View Magnifier Oral Vocabulary pollywogs eggs frog More Ideas Display pictures of frogs, pollywogs. Note: Pollywogs will eat lettuce or algae.

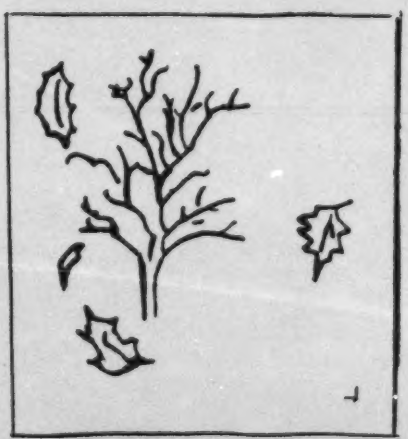
Evaluation Sheet

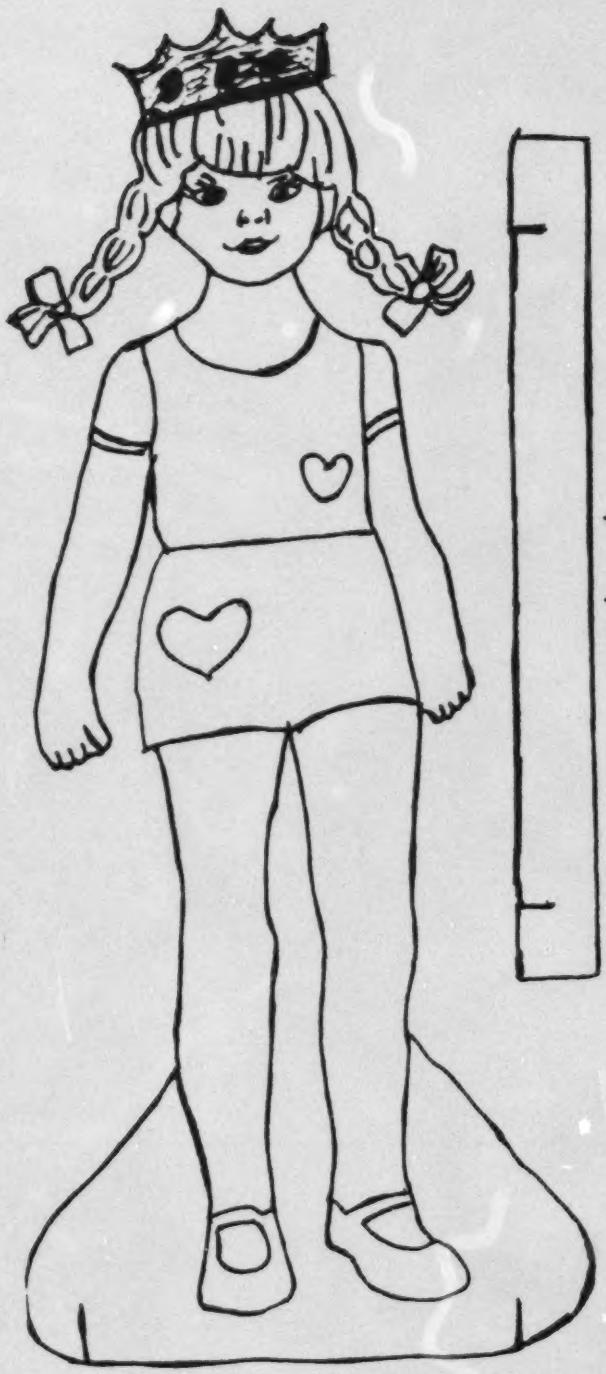
Match clothing, temperature and season.







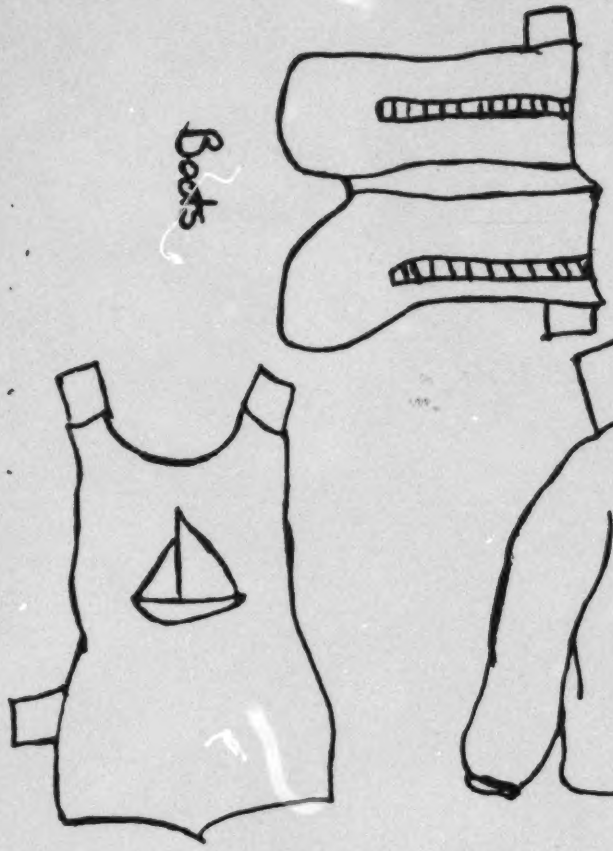




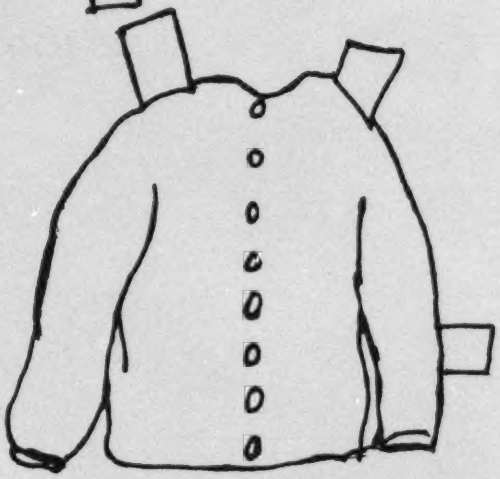
Stand

Snowmobile Suit

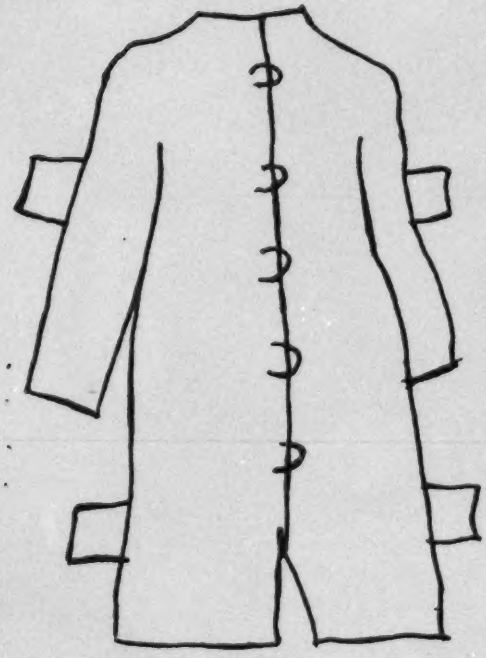
Princess Summer-Fall-Winter-Spring



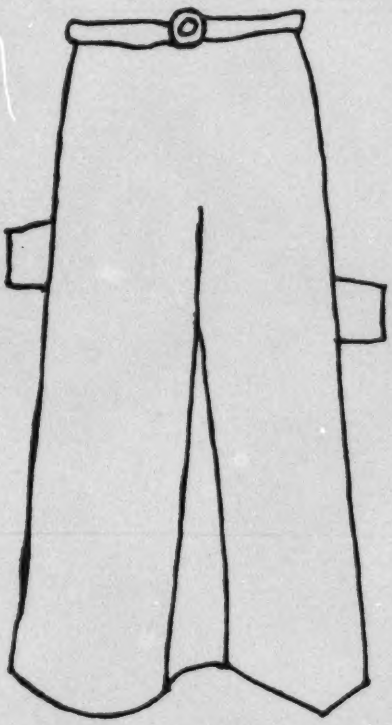
Swimming Suit



Sweater



Raincoat



Slacks

R O C K S

Grade 1

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Where are rocks found?	.....	1
What are some properties of rocks?	.....	2 - 4
How are rocks used?	.....	5
Evaluation sheet	.....	6 - 7
More ideas	.....	8

ROCKS

Overview

Students will predict how their senses of sight and tough help them learn about rocks, determine where rocks are found and observe the properties of rocks through the senses.

Major Concepts

1. Rocks are found most everywhere and their properties can be observed easily through the senses.
2. Rocks have practical and leisure time uses.

Materials Needed

rocks
shoe boxes
coffee cans
magnifying glasses (optional)
glue
paint
brushes
pipe cleaners
pebbles

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
Activity Title Rocks are found everywhere. Skills Generalizing Observing Collecting	Where are rocks found? Introduce the lesson by showing a variety of rocks to the class. Do these rocks look alike? What is different about them? Have you ever seen rocks like these before? Where? Have them go home and collect 5-10 rocks. Emphasize that their rocks should be as different looking as possible. Also, have the children bring with their collection, a small container with cover (e.g. shoe box, coffee can). (Next day) Have each child pick out their "favorite" rock and show it to the class. Where did you find that rock? Were all the rocks found in the same place? List various responses on the blackboard. Can you find rocks under water? Can you find rocks on mountains? Can you find rocks at your grandmother's house? Can you find rocks in China? Write on the blackboard, Rocks are found _____. Have children think of a word to fill in the blank.	Materials Needed small collection of rocks extra shoe boxes coffee cans with covers Note - Discourage the use of paper bags. More Ideas The daily writing lesson might be centered around making a rock collection. Oral Vocabulary everywhere different rocks

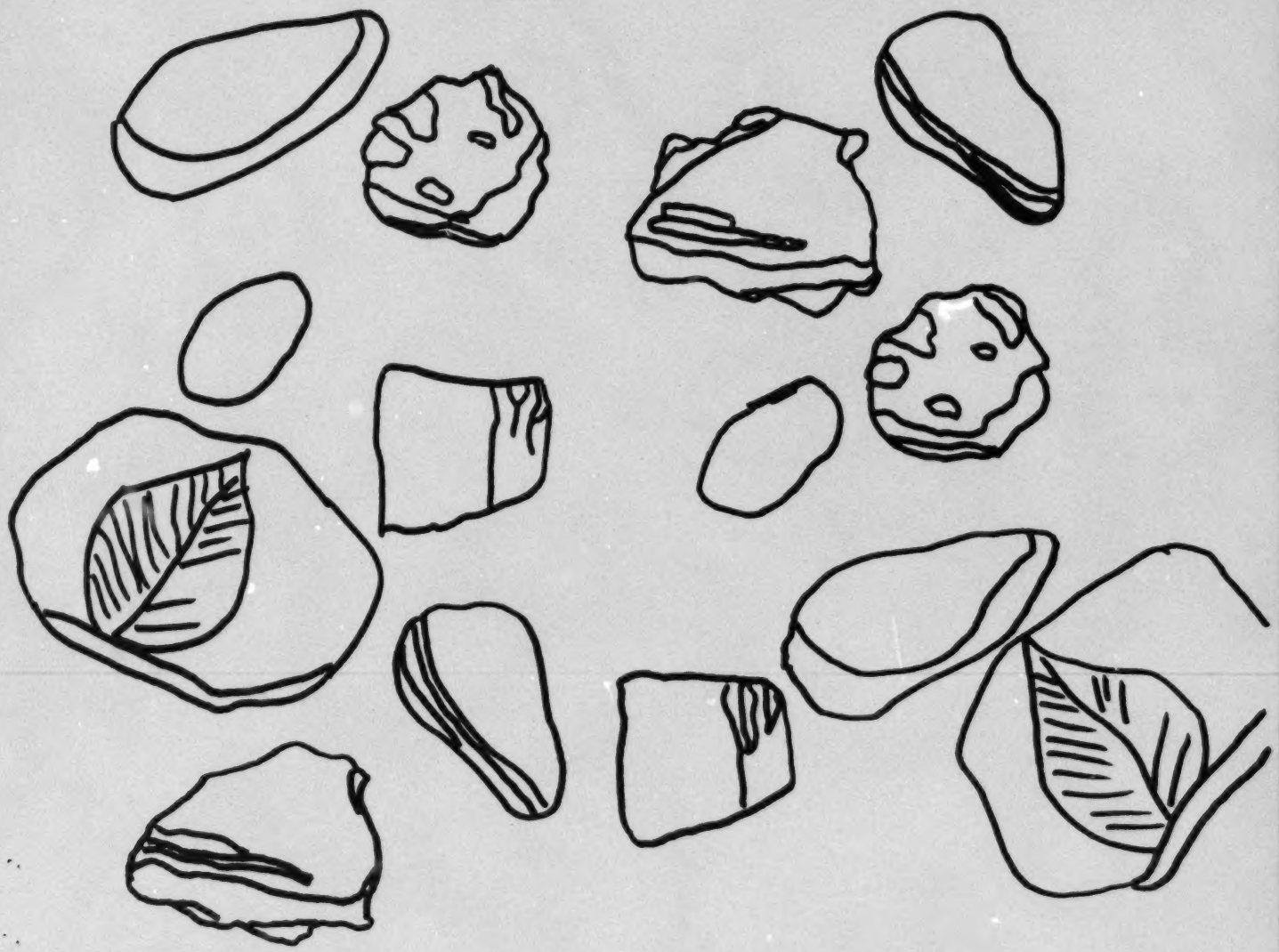
OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
Activity Title The properties of rocks can be observed easily through the senses.	What are some properties of rocks? Ask the children to sort their rocks by one property. Move about the room and encourage the children to talk about the ways they are using to sort their rocks. After the children have explored different ways to sort the rocks, list on the board all the ways of sorting the children suggest. Encourage the children to try as many ways as they can.	Materials Needed rocks magnifying glasses (optional) Note: This activity should take about 20 minutes.
Skills Classifying Manipulating Observing Making decisions Creating models	Rock Game While the children have the rock collections on their desks, walk around the room and choose a rock making a mental note of its characteristics. As you call out each property the children are to hold up the same kind of rock if they have one. Explain that they can change their minds when they hear more properties. Begin by giving very general properties such as rough or pointed shape. Continue by calling out more specific properties so that the pupils can narrow their choices to find the kind of rock the teacher chose.	Oral Vocabulary properties color shape size feel (smooth, rough) fossils

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
	Observe not only what the children hold up but take careful note of when and why they change their decisions. This way you can get feedback about how well they understand sorting rocks and can name objects by properties. Children will hold up various white rocks when they hear the property "white". Now using the white group the teacher should say "smooth". The children should hold up just the rocks that are both white and smooth. Continue this game for several rocks. <u>Extended Activity for Fossil Rocks</u> Show a sample of a rock with a fossil or ask if anyone has a rock with a fossil. How is the fossil rock made? Have students put a coating of vasoline over the shell or twig while the teacher is making a mixture of plaster of paris and water. This mixture should be like a pancake batter. Pour this mixture into a ½ pint milk carton that has the top cut off. (Bottom layer should be about one inch deep). Press the shells or twigs halfway into the plaster mixture and let dry.	<u>Materials Needed</u> plaster of paris 1/2 pint milk cartons shells, or twigs vasoline <u>Note</u> : This mixture will harden very quickly. <u>Note</u> : Press the twigs or shells <u>only</u> halfway into the mixture.

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
	Remove the objects from the bottom layer and coat the layer entirely with vasoline. Pour another layer of the mixture into the container and let dry completely. Tear away the milk carton and break the plaster along the line between the layers. What do you see? What is it called? <u>Evaluation</u> Use the sheet at the back of this unit on properties of rocks.	

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
Activity Title Rocks have many uses.	How are rocks used? Do people use rocks for anything? What are some uses of rocks? (jewelry, roads, buildings, headstones, paper weights, Indian tools).	Materials Needed Assortment of rocks pebbles glue paint brushes pipe cleaners (imagination)
Skills Discussing Manipulating	Pet Rocks Have each student choose a suitable rock(s) and various materials to construct a pet rock. Students might want to name them and tell about their pet rocks.	 Pet rocks make excellent gifts for fathers.

NAME _____



Evaluation Sheet
Properties

Matching Rocks - Ask children to:

1. Find two small, smooth rocks and color them pink.
2. Find two rough, medium-sized rocks and color them gray.
3. Find two rough, large rocks and color them black.
4. Find two boxed-shaped rocks and color them brown.
5. Find two tear-shaped rocks and color them blue.
6. Find two large, smooth rocks and color them green.
7. Find two fossil rocks and color them yellow.

MORE IDEAS

1. Visit a cemetary and look at the monuments and tombstones. Gravestone rubbings might be done.

2. Have a stone cutter visit the classroom.

3. See if you can locate someone in the community that polishes rocks as a hobby.

4. Develop a language experience chart on a part of this unit (properties, uses, etc.).

NIGHT AND DAY

Grade 2

Table of Contents

Where does the earth's light come from? ..... 1 - 2

If one side of the earth is having day, why is the other side having night? 3

What causes night and day on the earth? 4

How long does it take for the earth to make one rotation? ..... 5 - 6

Night and Day

Overview

Students will be able to describe the rotation of the earth by experimentation, demonstration, and compare the positions of the sun and earth during day and night.

Major Concepts

1. The sun is the earth's source of light.
2. One side of the earth has day while the other side has night.
3. The rotation of the earth causes day and night.
4. The earth rotates on its axis once every day. (24 hours).

Materials Needed

candle
matches
large sheet of oaktag
flashlight
globe
toothpick
globe marker (small flag)
clay
paper towel tube

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
Activity Title: The sun is the earth's source of light. Skills Observing Communicating Manipulating Predicting	Where does the earth's light come from? Light a candle in a darkened room. Place it on a table in the middle of the room. Students may be seated around the table. What is the only source of light in the room? (candle) In which direction is it shining? (all directions) Place a large sheet of oaktag between the candle and one section of students. Can everyone see the candle now? Why not? Move the oaktag in front of different sections of students until all have experienced the concept. Which side of the paper is light? Which side is dark? Have a student go out into the hall with a flashlight. Have another student stand in the darkened room just around the corner. Ask the student with the flashlight to shine it into the room. What is the student in the hallway doing?	Materials Needed candle matches oaktag flashlight Note: The children should be made aware that light can be blocked by opaque objects and that objects facing a source of light will be light on one side and dark on the other.

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
	Where is the other student? Where does the light start from? Where does it go? (straight ahead) What would the light hit if the student pointed it straight up? Why? If he pointed it straight down? Why? Is the light shining on the student standing around the corner? Why not? Blow out the candle and open the shades. Where is the light coming from now? Where is all the light outside coming from? (sun) How does the light from the sun get to earth. (straight lines)	Note: Stress that light always travels in straight lines.

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
Activity Title One side of the earth has day while the other side has night. Skills Creating Models Manipulating Observing Inferring Predicting	If one side of the earth is having day why is the other side having night? Shine the source of light onto the globe. If the globe were the real earth then what is the flashlight/projector representing? (the sun) Have students observe the front half of the globe and then walk around and observe the backside. What is different about the two sides? Why? Why isn't the backside lighted? (light can not bend around objects. It travels in straight lines.) If this globe were the real earth, what do you think the people on the backside would be doing now? (sleeping) Why? (night time) What might the people on the lighted side be doing? Why? (daytime)	Materials Needed flashlight or projector globe Oral Vocabulary: day night globe Note: Teacher could shine a light through a bent papertowel tube to show light only travels in a straight line.

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
Activity Title The rotation of the earth causes night and day. Skills Manipulating Observing Predicting Creating models	What causes night and day on the earth? Shine the flashlight/projector onto the globe. Does the earth stand still? How do you know? (We have night and day). Stick the globe marker on the globe with a small piece of clay near where you live. Have a student manipulate the globe so that the flag is where it should be when we are having daylight. Then have him manipulate the globe to where the flag would be when we are having night? What did you have to do to the globe to get it there? (turn it) Introduce the word rotation at this time. Using the globe, point out that the earth is not spinning straight up and down but that it is tilted to one side a little and it only spins in one direction. (counter-clockwise)	Materials Needed globe toothpick globe marker (flag) clay flashlight or projector Oral Vocabulary rotation tilted Rotation: the turning of the earth on its axis everyday (24 hrs).

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
Activity Title The earth rotates on its axis once every day (24 hrs.) Skills Observing Inferring Creating models Predicting	How often does the earth make one rotation? Point the globe towards the light so that the marker is at the midnight position. What time of day do you think this is? (midnight) Rotate the earth counter-clockwise and as it comes into the morning position stop it. What time of day is it now? (morning) Continue turning until it is in the noon position? What time of day is it now? Finally return the globe marker to the midnight position. What time of day is it? (midnight) As you turn the globe slowly say, "We just traveled in time from midnight, to morning, to noon, to evening, and back again to midnight. How long did this take? (one day - 24 hrs.) Emphasize that the earth makes one rotation everyday (24 hrs.)	Materials Needed globe clay globe marker (flag) flashlight or projector Oral Vocabulary midnight noon morning evening Mention that the next time they go out for playtime at noon notice what position the sun is in.

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
	How many times does the earth rotate in 2 days? in a week? Evaluation The students will be able to demonstrate the earth's rotation in relation to day and night.	

WATER CYCLE

Grade 3

Table of Contents

What covers most of the earth's surface? 1

What is colorless, odorless, tasteless and the secret of life? ..... 2 - 3

What are the three states that water is found in on the earth? ..... 4 - 5

What is evaporation? ..... 6 - 7

What is condensation? ..... 8 - 9

What is precipitation? 10

How is water collected and stored on the earth? 11

What is the water cycle? ..... 12 - 13

Evaluation Activities ..... 14 - 15

Water Cycle

Overview

Students will understand that water is a colorless, odorless, tasteless substance that is found in all areas of the world. It covers a major portion of the earth's surface and the phases of water continually change.

Major Concepts

1. Water is found and stored on the earth in solid, liquid, and gas phases.
2. Evaporation, condensation, precipitation, collection and storage are processes of water change and movement.
3. The water cycle consists of phase changes in an endless and recurring process.

Materials Needed

world globe
map of N.Y.S.
4 plastic glasses (clear)
white vinegar
7-up (without carbonation)
water
sponge
masking tape
magnifying glass
mineral oil
4 eye droppers
ice cubes
hot plate
metal or pyrex container
paper towels
plastic bag
2 tin cans
salt
tea kettle
pie tin
plastic dish
2 small jars

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
Activity Title The earth's surface .	What covers most of the earth's surface? Examine a world globe with the class. What do you notice about the earth's surface? If there more land or water? How much more water is there than land? Do you notice anything else besides the land (rock portion) and the water? (Yes, the polar ice caps).	Materials Needed World globe Map of New York State
Skills Observing Discussing	Examine a map of New York State. Where is the water on this map? Can you name some of the bodies of water on the map? Are there any other places where water can be found?	Oral Vocabulary polar ice caps oceans rivers , streams ponds springs ground water etc.

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
Activity Title Water is a colorless, odorless, and tasteless liquid. Skills Manipulating Discussing Predicting Classifying Observing	What is colorless, odorless, tasteless and the secret of life? Prior to class place one of the 4 clear plastic glasses at each of four different stations within the classroom. Each glass should be filled with one of the four substances* listed under materials needed. Later in the class the children will visit each station. They will observe the color, odor, and taste of each liquid *(see materials) and record their findings on a worksheet. The worksheet can be developed using student input. Hold up a glass filled with one of the substances and ask them: What do you think this is? (response) How do you know? How can we test this substance to be sure what it is? Make a chart of the pupils' responses. Example: (Your chart will vary according to pupils' responses).	Materials Needed 4 plastic glasses (clear) * white vinegar * 7-up (without carbonation) * water * mineral oil 4 eye droppers (clean) Oral Vocabulary colorless odorless tasteless Note: Caution the children about never tasting any unknown substances. Be sure to tell them that these substances are safe.

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS

cup	Smell	Taste	Feel	(Sight) (Looks)	Others
#1					
#2					
#3					
#4					

Now have the children visit each station and record their responses to each characteristic on their charts. (Caution - In the taste test have the children put a drop of the substance on their finger (using an eyedropper) and taste it.

After each pupil has visited each station collect their responses on the blackboard chart that you have made and discuss the properties of each of the four samples.

Is there one substance that is colorless, odorless and tasteless?
What do you think this substance is?

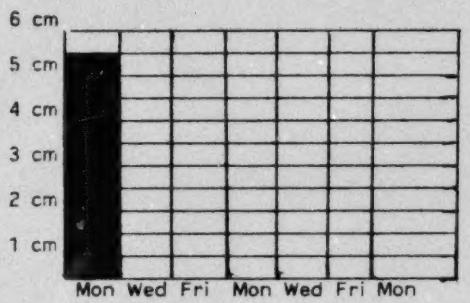
At this time you may want to identify the other substances pointing out their properties.

Note: Make sure that the eyedroppers are clean.
Emphasize to students not to put their fingers into the containers.

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
Activity Title Water can be found in three states: solid, liquid and a gas. Skills Observing Predicting Classifying	What are the three states that water is found in on the earth? Point out to students that all matter on earth is found in three states: solid, liquid or a gas. Can you name a solid substance in in the room? Can you name a liquid substance? Can you name a gas? Is there any substance that can be a solid, a liquid or a gas? (Don't give the students an answer.) Place an ice cube in a container on a hot plate and heat slowly. What is happening to the ice cube? (melting) Why is it melting? What do you think will happen if we continue to heat it? Continue to heat the ice cube until it has all melted and begins to evaporate. What is happending to the water? What do you think will happen if we continue to heat the water?	Materials Needed ice cube hot plate metal or pyrex container Note: Refer to any science text as to the definition of solid, liquid, and gas. Oral Vocabulary solid liquid gas meiting

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
	Continue to heat the water until all the liquid has evaporated. What happened to the water in the dish? Where has it gone?	

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
Activity Title Evaporation is part of the water cycle. Skills Observation Predicting	What is evaporation? Wet a sponge and wipe it across the blackboard. Observe what happens. Where did the water go? Why did the water disappear? Is there anything that we could do to speed up the evaporation process? (Challenge the students to come up with a way to quicken the evaporation. Next, wet two paper towels. Place one towel in a sealed plastic bag. Put both towels in a warm place. What do you think will happen to the towels by tomorrow? Why? Be sure to examine the towels the next day to see if the pupils' predictions are correct. Extended Activity (Graphing) To be done as either a class, group, or individual activity.	Materials Needed sponge water paper towel plastic bag Evaporation is the changing of water from the liquid to the gas phase. Oral Vocabulary evaporation water vapor

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
	Place a metric ruler in a glass of water. After every two days read the level of the water on the ruler (in cms.) and place the results on the graph. Discuss the results.  	Note: As a variation, glasses can be put in different locations. (Example - closet, window sill, heater, etc.)

OUTLINE CONNECTION

Activity Title

Condensation is a part of the water cycle.

Skills

Observing
Predicting
Comparing

101

ACTIVITY

What is condensation?

Water is continuously evaporating from the earth's surface. Where does this water vapor go?

Fill one can with warm water as a control. Fill the second can with crushed ice, cold water and a pinch of salt. Observe what happens to the outside of the cans.

What do you observe about the outside of the cans?
Where does the water come from?
Why does the water form on one can and not the other?
What is the difference in the two cans?

Introduce the term "condensation."
Where have you noticed condensation before? (dew, fogged up glasses, kool-aid pitcher, kitchen windows in the winter).

If we leave this can here for a few hours, can we predict what will happen to the water on the outside?

Point out that water is always in constant change.

Breathe on the blackboard and show the condensation of the warm water in the breath on the cooler surface of the blackboard.

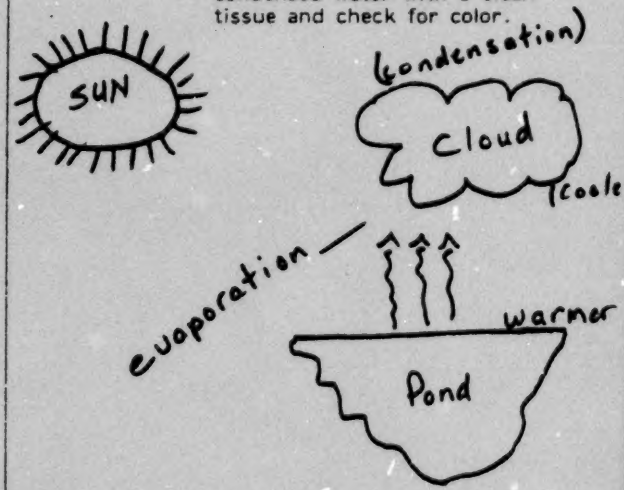
INFORMATION FOR TEACHERS

Materials Needed

2 tin cans (soup can size)
ice (crushed)
salt
water

Condensation is the process of changing a gas to a liquid.

Note: Colored water can be used in the cans to prove that the water is not coming from inside the can. Wipe the condensed water with a clean tissue and check for color.



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OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
	What will happen to the water on the blackboard? After the water has evaporated ask where did the water go? Point out that the same process happens in our atmosphere as the water vapor cools to form clouds. What do you think it is like inside a cloud? It is warm or cool? Have you ever walked through fog or driven through it? What did you notice or what did it feel like? Point out that fog is really a cloud formed at ground level.	<u>Oral Vocabulary</u> condensation clouds fog

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
Activity Title Precipitation is a part of the water cycle. Skills Observing Predicting	What is precipitation? Place ice cubes in a pie tin and hold out over the steam from a heated tea kettle. What do you notice happening on the bottom of the pie tin? What do you think will happen as more and more water condenses on the bottom of the pie tin? Why? If this pie tin were a cloud in our atmosphere, what would we call these heavy drops? Point out that rain is only one form of precipitation. Can anyone think of any other forms of precipitation? Fill a glass full of hot water. Next place some crushed ice in a dish and place the dish over the cup. Some of the water evaporates becoming water vapor. The water vapor then cools and condenses forming water droplets.	Materials Needed hot plate tea kettle ice cubes pie tin Precipitation: a form of water which falls to the ground from clouds. (rain, snow, sleet, hail) Oral Vocabulary precipitation Note: If a hot plate is not available, this experiment may be done for precipitation. Materials Needed clear drinking glass (heat resistant) crushed ice or cubes hot tap water plastic dish

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
Activity Title Collection and storage is a part of the water cycle? Skills Discussing	How is water collected and stored on the earth? Ask: If you were a rain drop, what are some of the journeys you could make? Conduct a brainstorming session for the responses.	Storage of water - oceans, lakes, streams, ponds, rivers, ground water, plants, animals, ice caps, etc. Oral Vocabulary storage

OUTLINE CONNECTION

Activity Title

The water cycle.

Skills

Observing
Discussing

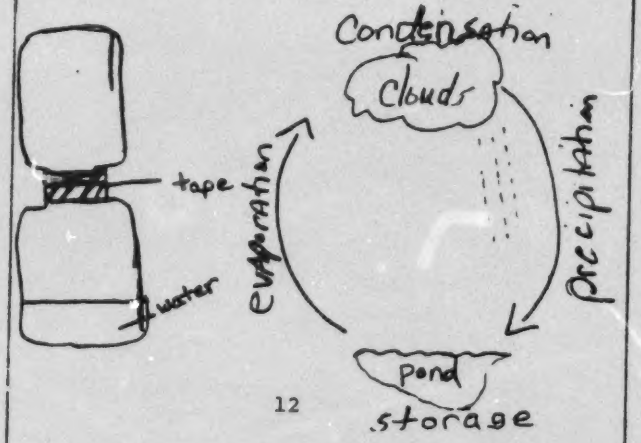
ACTIVITY

What is the water cycle?

Place some water in one jar and tape the two jars together at the mouths. Place the sealed jars in water in the pan. Heat the water in the pan until it boils.

What happens in the top jar?
Why?

How do you explain what happens?



INFORMATION FOR TEACHERS

Materials Needed

2 small jars
tape
water
hot plate
magnifying glass (optional)
pan

Oral Vocabulary

water cycle

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
	Relate the experiment to a simple diagram of the water cycle. Ask: 1. In the experiement, the water in the bottom of the jar represents what part of the diagram? 2. The hot plate can be related to to what part of the diagram? 3. What effect does the hot plate have on the stored water in the bottom jar? 4. At first, the water in the upper jar represents what part of the diagram? 5. As the water collects and begins to fall, what part of the water cycle does this represent? Point out that a cycle is like a circle. It has no beginning and no end. Why might people use the word "cycle" to explain the movement of water on the earth? How much water was on the earth ten years ago? How much water will be on the earth ten years from now?	Note: The water cycle chamber can be placed on a window sill and the water cycle can be observed over a period of time.

Evaluation Activities

1. Language Arts - Pretend tht you are a drop of water somewhere on the earth. Before you write think about where you are, where you have been, where you are going, how long you have been around, the different forms you have taken, etc.

2. Using a world map and the symbols below, have the children place them on the map and explain which part of the water cycle each one stands for.

Symbols = evaporation (sun)

= condensation (clouds)

ooo and * * * precipitation (rain, snow)

3. Test (see following page)

1. On what kind of day would a puddle dry up the fastest?

   a. warm and windy
   b. cloudy and wet
   c. wet and windy

2. Suppose you had a wet washcloth. To make it dry fast you could

   a. put it in the refrigerator
   b. hand it outside in the bright sun
   c. fold it and put in a plastic bag

3. Clouds are made of

   a. smok in the air
   b. air moving very fast
   c. water in the air

4. Which of these things helps to make the weather?

   a. water b. stones c. wind vane

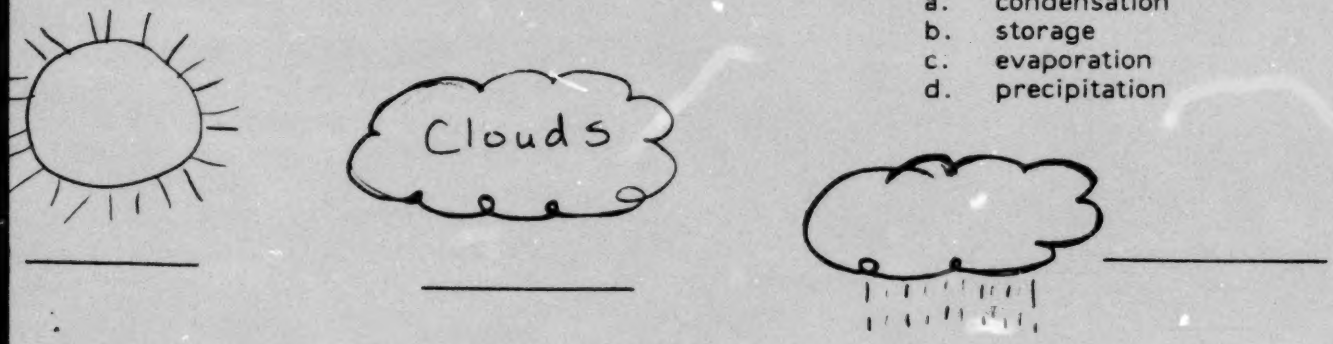
5. Name 3 forms of precipitation

   _____ _____ _____

6. The water cycle is like a circle. This means

   a. it never ends
   b. it ends after it rains
   c. it happens once a year

7-10. Label the following diagram:



_____

_____

_____

_____

_____

a. condensation
b. storage
c. evaporation
d. precipitation

ROCKS AND MINERALS

Grade 4

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Rocks and Minerals

Overview

Rocks are classified according to the way in which they were formed and the minerals from which they are composed.

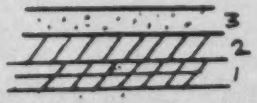
Major Concepts

1. There are many different kinds of rocks.
2. Sedimentary rocks are formed by sediment falling through water forming layers.
3. Organisms trapped between layers of falling sediment helps explain the presence of fossils found on Earth.
4. The cooling of magma forms igneous rock, also called fire rock.
5. Heat and pressure change sedimentary rocks to form a new rock called metamorphic rock.
6. Items can be distinguished and classified by examining the properties of each.
7. Different properties of rocks allow one to distinguish one rock from another.
8. Rocks are composed of different minerals which give them their various colors and textures.
9. Minerals can be identified by hardness.

Materials Needed

assortment of rocks
magnifying glasses
small jar with lids
coarse sand
fine sand
pebbles
pencils
gravel
shells (2 or 3)
leaves
plaster
milk cartons
pie tin
pudding mix (not instant)
small glass dishes
hot plate
cooking pan
shale
broken candles
two pans that will
fit inside each other
aluminum foil
pens
paper clips
rubberbands
tacks
paper
chalk
wood
nail
cotton
bandaids
screws
bolts
granite
conglomerate
marble
gneiss
egg cartons
gray granite
pink granite
mineral collection (optional)
copper pennies
table knives
pieces of glass
milk
pliers
cotton
Q-tips
nuts
sandstone
slate

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
Activity Title Sorting rocks Skills Formulating Hypothesis Manipulating Observing Recording Classifying Concept That there are many different kinds of rocks.	Are all rocks the same? Have students bring in a number of of rocks. Then break class into small groups giving each group at least one magnifying glass to observe rocks. Have students on paper, note all differences they find. Discussion Questions 1. Are all the rocks the same? How are they different? 2. Why do you think the rocks are different?	Materials Needed assortment of rocks magnifying glasses Note: This is strictly an initiating activity.

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
Activity Title Forming sedimentary rock. Skills Inferring Observing Reporting Discussing Concluding Generalizing Predicting Replicating Concept Sedimentary rocks are formed by sediment falling through water forming layers.	What is sedimentary rock? Break students into small groups giving each group one small jar with with a lid on it. Set out small containers each containing different types of sand (coarse, fine, pebbles). Fill jar halfway with water, pour different amounts of the sand in jar. Place lid on jar and shake. Observe what is happening in jar. (use of magnifying glass would aid observation) Discussion Questions 1. What is happening in jar? 2. Draw layers of rock on blackboard.  a. Which layer formed first? (1) b. Which layer will turn to rock first? (1) Why? c. Why can we find sedimentary rock in our backyards? (Land area was once covered by water).	Materials Needed small jars with lids coarse sand, fine sand pebbles water magnifying glass (optional) Note: This activity can be adopted to small groups or each individual student. Teacher should stress the raining effect of the sediment falling in water. Rock formed by sediment raining through the water is called sedimentary rock.

OUTLINE CONNECTION

Activity Title

Fossils in sedimentary rocks.

Skills

Inferring
Sequencing
Manipulating
Observing
Discussing
Concluding
Predicting
Creating Models
Interpreting

Concept

Organisms trapped between layers of falling sediment helps explain the presence of fossils found on the earth.

ACTIVITY

How are fossils formed?

In making fossils you will need a pencil, ½ cup of water, and one cup each of gravel, sand, and plaster. Also needed are a milk carton and parts of dead plants and animals.
(Leaves, shells, twigs etc.)

Next punch small holes in bottom of milk carton with end of pencil. Place on pie tin. Place part of sand, gravel and plant and animal matter in bottom of milk carton. Then cover with thin layer of plaster and water mixture. Repeat the entire procedure for 3 or 4 days. After a few days when mixture has dried, peel off milk carton. The result will be layers much like that which is formed in real sedimentary rock.

Students should then break apart their plaster molds with a small hammer. Examine them for imprints.

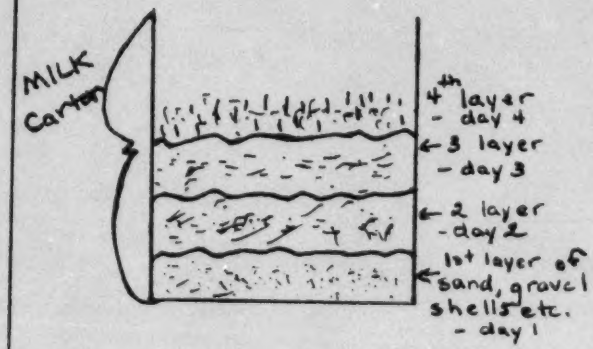
INFORMATION FOR TEACHERS

Materials Needed

water
pencil
sand
gravel
shells
leaves
plaster
milk carton
hammer
pie tin

Note: Consistency of plaster should be somewhat watery, not thick, to allow it to seep between sand and gravel.

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS



Discussion Questions

1. How many layers do you have and what do they show? (Layers indicate passage of time that elapsed to form each layer).
2. What kind of rock is it? (Sedimentary)
3. What type of material do you find on the bottom of each layer? (Heavier stone and gravel settle to bottom first).
4. What would happen if something died and was trapped between the layer? (fossil is formed)

OUTLINE CONNECTION

Activity Title

Igneous rock

Skills

Observing
Discussing
Comparing
Generalizing
Concluding
Inferring

Concept

The cooling of magma forms igneous rock, also called Fire rock.

ACTIVITY

What is igneous rock?

To demonstrate how igneous rock is formed cook pudding in front of class. (Have students note how pudding bubbles up as it is cooked). Pour pudding into small glass containers. Note film forming on top of pudding.

When film has completely formed over top of pudding, note temperature of surface as compared to inside of pudding. (This can be measured by touch or by using a thermometer).

Discussion Questions

1. What formed over top of pudding? (Crust)
2. Why did it happen? (Cooled first)
3. How does the inside of the pudding feel in relationship to the top? (It is much warmer)

INFORMATION FOR TEACHERS

Materials Needed

large pudding mix (not instant)
small glass dishes
hot plate
pan
3 cups milk

Note: Teacher should relate the film on pudding to cooling of the magma. This cooling formed the earth's crust. This magma is called igneous rock when cooled. Teachers may also want to ask students why do they suppose that some people call igneous rocks, ("Fire rock".)

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
Activity Title Metamorphic rock.	How is metamorphic rock formed? Take different colored candles and and melt in small pan over hot water until wax is soft. Stir briefly, then pour half dollar size globs onto a sheet of aluminum foil. Allow to cool. (Wax should remain soft to touch).	Materials Needed pieces of colored candles hot plate two pans that fit inside each other aluminum foil
Skills Creating models Generalizing Inferring Making decisions Manipulating Observing Predicting	Students should then take two or or three globs each and "firmly" press together until it hardens. Note strata, color, and composition differences.	Safety Note: Be sure to heat wax in double boilers or in a pan set in another pan of water.
Concept Heat and pressure change sedimentary and igneous rocks to form a new rock called metamorphic rock.	1. Ask each student to describe their wax rocks. List all changes on blackboard. 2. What causes each of these wax rocks to look different? (Different kinds and portions of wax being mixed together. 3. What two things cause changes in the wax? (heat and pressure)	Note: Metamorphic rock is rock formed from other rocks under heat and pressure.

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS

Activity Title

Sorting and classifying.

Skills

Visual discrimination
Making comparisons
Observing
Catagorizing
Classifying
Sorting
Inferring
Formulating hypothesis

Concept

Items can be distinguished and classified by examining the properties of each.

How can objects be classified?

Put an assortment of common objects on a desk for students to classify. This might include such items as pencils, pens, paper clips, rubber bands, tacks, paper, chalk, wood, nail, pliers, cotton, bandaids, Q-tip, screws, nuts, bolts etc. Give the students time to look through all their materials and ask the following questions.

Discussion Questions

1. How can you separate the items into two groups? (i.e. metal and nonmetal)
2. Can you divide them into even more groups?
3. What properties did you use to group items?
4. How else can you divide the objects?

Materials Needed

pencils	pliers
pens	cotton
paper clips	bandaids
rubberbands	Q-tips
tacks	screws
paper	nuts
chalk	bolts
wood	nail

Note: This activity will give students some experience in sorting and classifying by examining characteristic properties of objects. This will aid them in identifying rocks.
Stress that rocks are grouped based on characteristics they possess.

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
Activity Title Rock Identification Skills Observing Comparing Recording Reporting Discussion Concluding Concepts Different properties of rocks allow you to distinguish one rock from another.	How can rocks be identified? Students are to be given a sample of each rock. After examining each rock one at a time, they are to mark down, on their activity sheet those properties that allow the student to distinguish that particular rock. Teacher and students should then discuss their findings before moving on to the next rock. See activity sheet on the following page.	Materials Needed activity sheets sandstone granite slate shale conglomerate marble gneiss egg carton Note: This activity can be used in small groups or individually. It is a good idea however, to have children working in at least groups of two so that ideas can be shared.

ROCK CHART

Kind of Rock	Color	Mass	Shiny	Rough or Smooth	Layers	Hardness	Type
Sandstone							
Granite							
Slate							
Shale							
Conglomerate							
Marble							
Gneiss							

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
	Evaluation 1. After discussing properties of each rock, mix rocks up and have students identify each using their rock chart. 2. Use egg cartons and label each compartment with the name of a particular rock that students have studied. Then have them use their activity sheet to compartment. Sandstone goes in compartment labeled sandstone and so on.	Note: Students can also start their own individual rock collections using egg cartons. On rock activity sheet "type" means sedimentary, metamorphic or igneous.

OUTLINE CONNECTION

Activity Title

Minerals in rocks.

Skills

Observing
Discussing
Manipulating
Reporting

Concept

Rocks are composed of different minerals which give them their various colors and textures.

ACTIVITY

Of what are all rocks made?

Break class into small groups giving each group a piece of granite (pink or gray) and a magnifying glass. Have children examine the rocks carefully.

Discussion Questions

1. What do you see?
   a. black color = mineral
   b. pink color = mineral feldspar
   c. glossy crystals = mineral quartz
   d. flakey gold color = mineral mica
   e. white color = also mineral feldspar

INFORMATION FOR TEACHERS

Materials Needed

gray granite
pink granite
magnifying glass

Note: All rocks are made of minerals. Some rocks are made of just one kind of mineral. Others are composed of many different minerals such as granite. Geologist can determine the kind of rock by also knowing the mineral composition of the rock they are studying.

Extension

Go on to examine the minerals found in rocks other then granite.

OUTLINE CONNECTION

Activity Title

Using the Scratch Test to Identify Minerals.

Skills

Classifying
Generalizing
Identifying variable
Interpeting data
Making decisions
Manipulating
Observing
Recording data
Using numbers

Concept

Minerals can be identified by hardness.

ACTIVITY

How is the scratch test used in identification of minerals?

Write the following hardness chart on the blackboard.
Explain: One means of distinguishing one mineral from another is by examining the hardness of the mineral. Go over chart first.

Hardness Number	Simple Test	Mineral
1	Fingernail scratches it easily.	Talc
2	Fingernail barely scratches it.	Gypsum
3	Copper penny just scratches it.	Calcite
4	Table knife scratches it easily.	Fluorite
5	Table knife barely scratches it.	Apatite
6	Scratches glass easily.	Feldspar
7	Scratches steel and glass	Quartz
8	Scratches all other common minerals	Topaz
9	Scratches Topaz	Corundum
10	Hardest mineral	Diamond

INFORMATION FOR TEACHERS

Materials Needed

Collection of minerals enough for each group
copper pennies
table knives
pieces of glass
(A rock collection kit is most easily used).

Note: Minerals can be identified by their hardness. Diamond is the hardest of all minerals. Talc is the softest
The hardness of a mineral can be determined by using a scratch test. This test for some minerals is found under the activity column. Other minerals can be substituted for those given.

Extension
Use other properties to identify mineral such as color, (quartz may be colorless, milky white or pink), texture (some minerals feel rough or smooth) and luster (some are very shiney, pyrite is shiney and looks like gold).

Glossary

Basalt	-	An ingneous rock that is fine grained and may be dark green or nearly black.
Conglomerate	-	A rock made of pebbles cemented together.
Feldspar	-	Pink colored mineral found in granite.
Fossils	-	Remains of animals and plants that have been changed to rock.
Gneiss	-	Coarse grained metamorphic rock and may look striped.
Granite	-	Igneous rock having a salt-and-pepper look.
Hornblend	-	A black colored mineral found in granite.
Igneous Rock	-	Made of different sized pieces of other rock "cemented" together and may contain fossils. (Fire made rock)
Marble	-	Limestone that has been changed by heat and pressure. A metamorphic rock that may be red, white, pink, or black.
Metamorphic Rock	-	Formed from igneous and sedimentary rock that has been changed by heat and pressure.
Obsidian	-	Black colored igneous rock often called black glass.
Property	-	Anything that is generally true of a substance, and can be tested.
Quartz	-	A mineral with large crystals with six sides.
Sandstone	-	A sedimentary rock of coarse or fine-ground sands pressed together.
Sedimentary Rock	-	A kind of rock formed from pieces of broken rock (or sand) and plant and animal remains "cemented" together.
Shale	-	Sedimentary rock formed from clay, gray-black in color, with a muddy odor when wet.
Slate	-	Metamorphic rock formed from shale and can be split into sheets. It may be red or black.

EARTH'S CHANGING SURFACE

Grade 5

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Earth's Changing Surface

Overview

Students will become aware that the Earth's surface is constantly in a state of change due to constructive - destructive forces.

Major Concepts

1. The earth is composed of three different layers: the crust, the mantle, and the core.
2. Geologists learn about the inner earth by indirect observation when they study earthquakes and volcanoes.
3. Forces within the earth form different types of mountains.
4. Weathering is the breakdown of rock by physical or chemical means.
5. Landscapes of the earth are shaped and changed by both nature and humans.
6. The earth's crust is organized into several plates that move or drift.

Materials Needed

3 colors of clay
food coloring
small jars with lids
vinegar
fine wire mesh
salt
flour
scissors
straws
newspaper
vegetable oil
iron filings
clean sand
glue or paste
sand
ruler
3 round pencils
marking pen
tape
washers
baby food jars with lids
baking soda
large pan
2 sheets of graph paper
sandstone
rocks
pebbles
oaktag
vermiculite
plastic bag with tie

OUTLINE CONNECTION

Activity Title

Layers of the earth.

Concept

The earth is made up of three layers the crust, mantle and core.

Skills

Creating models
Formulating hypothesis
Generalizing
Manipulating
Observing

ACTIVITY

What do you think the earth is like further down under all the soil?

In this investigation students will be forming a model of the earth, discovering each layer.

Break children into groups of four or five. Give each group a small piece of clay and shape it into a small ball. Then give them a different color piece of clay and have them wrap it around the small ball of clay. (This second piece of clay should be five times larger than first). Have children then wrap another piece of a third color of clay around entire ball. (This should be a thin layer). Now have students cut clay in half using wooden ruler. Examine layers.

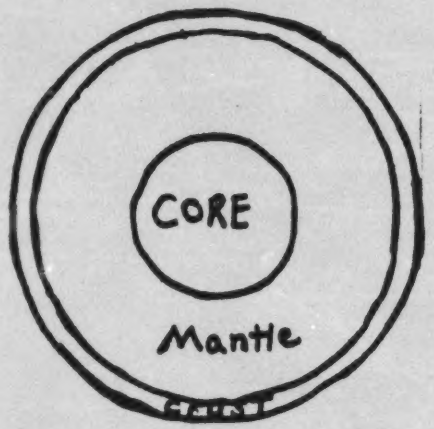
INFORMATION FOR TEACHERS

Materials Needed

Clay in three different colors

Note: The model displays how geologists "think" the earth is made up. The crust is a thin outer layer. In some places, such as under the oceans, it may be as thin as five kilometer. The mantle is located just beneath the crust It consists mainly of molten rock (magma). Some scientist "believe" that the magma forms the earth's crust. The mantle surrounds the core. It has the highest density of the earth's layers. It is under so much pressure that it's mass and temperature are extremely high. It is believed to consist mainly of iron and nickel.

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS



Disucssion Questions

1. After cutting ask: What does your model look like? (Has 3 layers).
2. Which layer is the thinnest? (outer layer - call it the crust)
3. How would you describe the layer beneath the crust? (It's thicker, - called mantle)
4. How would you describe the layer beneath the mantle? (bottom layer, thicker than crust, - called the core).

Extension

Use an apple to represent the layers of the earth. The crust would be as thin as the skin, the white part of the apple would be as thick as the mantle and the core of the apple as thick as the core of the earth.

OUTLINE CONNECTION

Activity Title

Formation of Earth's Layers.

Concept

Scientists use the fact that heavier materials, such as metals, will settle to the bottom of a liquid first, leaving lighter materials on top.

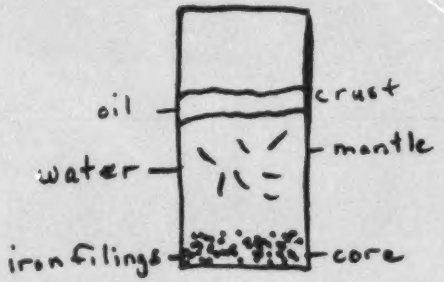
Skills

Creating models
Working with hypothesis
Generalizing
Inferring
Manipulating
Observing

ACTIVITY

Why do some scientists "believe" the core of the earth is composed of metals?

Break students into groups giving each a small jar with a lid. Fill the jar about 1/3 of the way up with water. (Color water, by adding food coloring - makes the investigation a little more interesting). Then pour a little vegetable oil into jar. Complete by adding iron filings. (Clean sand can be substituted for iron filings). Place lid on jar and shake. Observe what happens. (Oil floats on top- (crust), iron filings settle to bottom (core), water in between (mantle).)



INFORMATION FOR TEACHERS

Materials Needed

small jars with lids
food coloring (optional)
vegetable oil
iron filings
clean sand (to be substituted for iron filings)

Note: One of the theories explaining the materials found in the layers of earth is that as the earth cooled and solidified the heavier materials, such as metals, sank to the bottom. This helps explain nickel and iron composition of the earth's core.

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
	Discussion Question 1. What substance do you find floating on the top? (oil) 2. What happened to the iron filings? (Settled to bottom) Why? (heavier) 3. Which layer represents the a. crust? (oil) b. mantle? (water) c. core? (iron filings)	

OUTLINE CONNECTION

Activity Title

Volcanoes as evidence of earth's inner pressure.

Skills

Replicating
Inferring
Concluding
Observing
Measuring
Manipulating

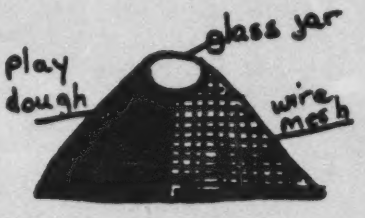
Concept

Volcanoes are physical evidence of the earth's inner pressure.

ACTIVITY

What causes volcanoes?

Use a small glass jar and fill 3/4 of baking soda. Surround it with a piece of fine mesh wire. Mix 1 cup of flour. Add enough water to make a thick dough. Cover the wire mesh with the dough.



Pour vinegar into the top of glass jar and observe action of the soda vinegar combination.

Discussion

What caused the vinegar and soda to bubble - up and flow from the model? (Pressure from escaping carbon dioxide caused foam to flow out).
What in the model represents the pressure inside the earth? (Carbon dioxide gas escaping).

INFORMATION FOR TEACHERS

Materials Needed

1 baby food jar
baking soda to fill to 3/4 full
1/2 cup vinegar
fine wire mesh
1 cup salt
1 cup flour
water

Note: The play dough could be replaced with other material such as paper mache.

Vinegar and soda combined have a chemical reaction which produces the gas carbon dioxide.

OUTLINE CONNECTION

Activity Title

Earthquakes are evidence of inner pressure.

Concept

Earthquakes are evidence that can be used to help earn about the inner earth.

Skills

Creating models
Interpreting
Manipulating
Concluding
Inferring
Observing

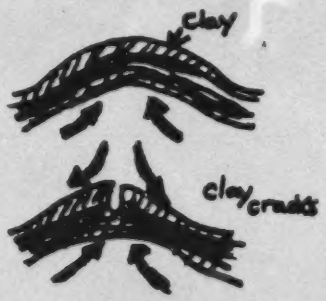
ACTIVITY

What happens during an earthquake?

Put your hands together. Press them very hard. Now open them and feel them. How did they feel? (warm) Now put your hands together so that palms are together and in opposite directions but thumbs are not interlocked. Press hard and move your hands in opposite directions.

What happens to your hands? (Sudden snapping and sliding).

Shape three separate pieces of clay into a thin flat rectangular shape. Place one piece on top of another so that there are three layers of clay that are smooth. Have children observe that they are smooth. Press sides of model until cracks appear on surface of top layer.



INFORMATION FOR TEACHERS

Materials Needed

3 pieces of clay

Note: The earth's crust is broken into large pieces called plates.

The places where rocks along the sides of a crack have moved is called a fault.

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
	Discussion Questions 1. What caused the clay to bulge in the middle? (Pressure) 2. How could this happen to the crust on our planet? (Pressure from the mantle pushing on the crust.) 3. What do you notice on the top of the clay? (Crack) 4. What would happen if our planet's crust cracked as a result of this pressure from beneath the crust? (Earthquake). Take a stick break it, notice the sudden snap. The crust is brittle like the stick and what we feel is the breaking or snapping of the crust.	Pressure underneath the crust causes the crust to be pushed up. If the pressure results in wave-like bends we call this process folding. Pressure that causes a break across layers of the crust is called faulting If crack along a fold or a fault is deep enough magma from the mantle may seep up, resulting in a volcano. Folding and faulting explain the existence of many of the mountains and hills found on our planet.

OUTLINE CONNECTION

Activity Title

Measuring earthquakes with a seismograph.

Concept

Observing earthquake activity with a seismograph gives evidence of activity within the earth.

Skills

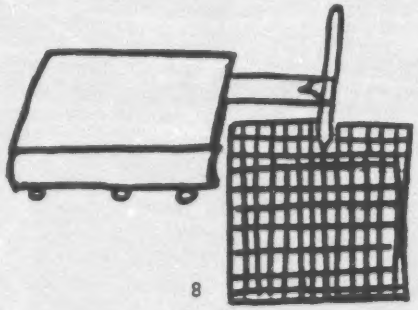
Creating models
Inferring
Generalizing
Manipulating
Concluding

ACTIVITY

How can an earthquake be measured?

Put a ruler inside a book. Set the book on three round pencils. Tape a felt tip pen to one end of the ruler.
With a piece of graph paper placed beneath the pen so it just touches the paper, pull the paper back toward you in a straight line.
A seismograph records the movement of the earth. A straight line on a seismograph indicates there are no detectable earthquakes.
Put a new piece of paper in the same place. While one person is pulling the paper in a straight line, another person will shake the work space from side to side. Note the difference in the line being drawn?

What would cause this kind of line on a real seismograph? (earthquake)



8

INFORMATION FOR TEACHERS

Materials Needed

ruler
3 round pencils
book
marking pen
tape
2 sheets of graph paper

Note: A seismograph is an instrument used by scientists to measure the intensity of an earthquake.

OUTLINE CONNECTION

Activity Title

Earth's Moving Surface

Concept

The earth's crust is organized into several plates that move or drift.

Skills

Hypothesizing
Comparing
Generalizing
Modeling
Manipulating
Predicting
Observing
Inferring
Acquiring vocabulary

ACTIVITY

Was the earth exactly the same 100 million years ago?

To see how the earth's land forms may have fit together in the past, trace the map of the continents. Label the continents and cut them out. Put them together on a piece of blue paper so they fit closely together. Glue the pieces in place. Compare your results with others in your class. How are the results the same or different?

Discussion Questions

1. What might have caused the continents to move or drift apart? (Movement of the magma under the crust).
2. What may have caused the giant continent to break apart? (Pressures from the magma beneath the crust).

INFORMATION FOR TEACHERS

Materials Needed

2 worksheets
scissors
glue or paste

Note: The map to be traced and cut out may be enlarged on an overhead before copying for student use.
Use glossary with students to note and discuss the terms plate and drift. The map project may be enlarged and done by the students as a large bulletin-board display.

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
	Discussion Questions con't 3. What might have happened to the earth as a result of this breaking apart? (The earth is broken into large separate pieces.) 4. What activities of the earth might occur if the pieces or "plates" of the earth move and rub together? (earthquake) 5. What earth activity we have studied might occur if the plates drifted apart? (volcano) 6. Look at the worksheet showing the volcano and earthquake pathways. What can you notice about where most earthquakes and volcanos occur? (along the earth's plates) 7. Will the earth's continents be in the same position 100 million years from now? (Probably not if the drift theory is correct).	

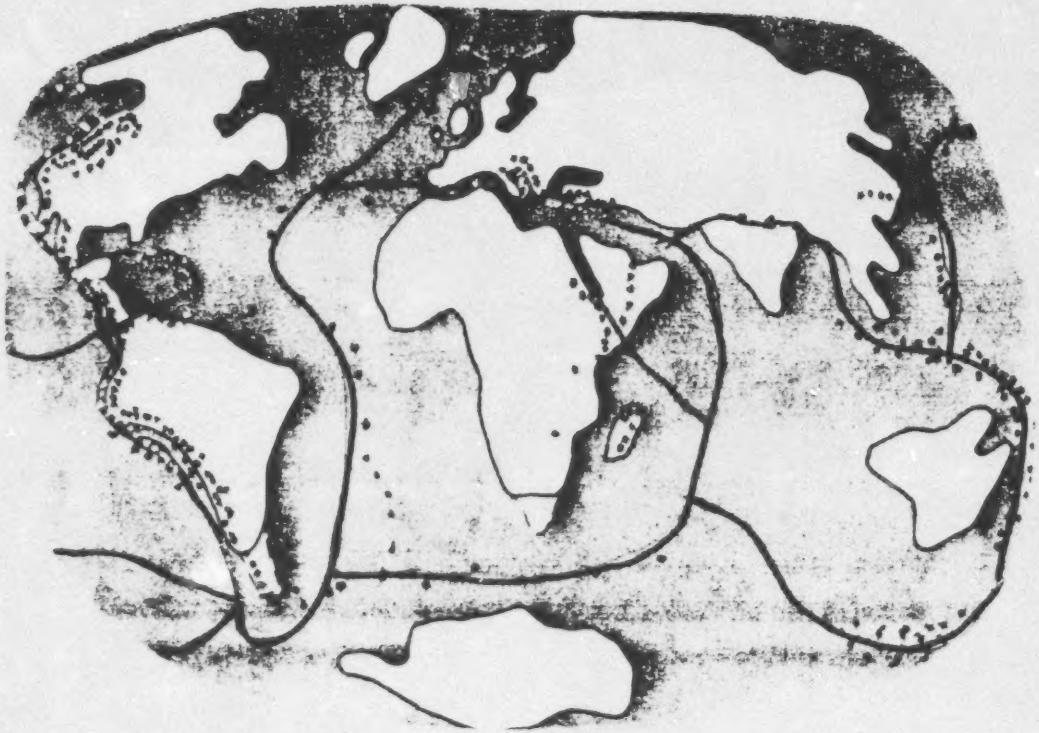
200 million years ago

100 million years ago

Map of Continents

Present

Volcano and Earthquake Pathways



Key:
Solid Lines = Outline of Crust's Plate
Dots = Volcanoes and Earthquakes

OUTLINE CONNECTION

Activity Title

Erosion by Water.

Concept

The earth's surface is constantly being worn down by water.

Skills

Creating
Generalizing
Manipulating
Observing

ACTIVITY

How can water wear down the surface of the earth?

Break class into groups. Give each group a jar with a lid and a small piece of sandstone.
Fill jar halfway with water. Place sandstone in jar and cap with lid. Shake jar for about one or two minutes. Examine bottom of jar.

Discussion Questions

1. What do you find in bottom of jar? (particles of sand)
2. How did they get there? (sandstone was warn down by water.)

Somewhere in the classroom use a a large pan and make a pile using sand, rocks, and pebbles. Pour water over material.

Discussion Questions

1. What is happening to pile of material? (worn away by water)
2. What materials are being washed away first? (fine materials)
3. Are the large rocks being washed down like the sand? (No)
4. Why? (Rocks are heavier, harder, etc.)
5. How do you think I could get the large materials to move? (Increase flow and amount of water)

INFORMATION FOR TEACHERS

Materials Needed

jars with lids
sandstone
large pan
sand
rocks
pebbles

Note: Erosion is the wearing away of the earth by wind and water.

Point out to students how water eroded a gully into the sand. Relate that to the formation of the Grand Canyon by Colorado River.

This is also a good time to take students outdoors to look for samples of erosion.

OUTLINE CONNECTION

Activity Title

Wearing away of the earth by wind erosion.

Skills

Generalizing
Manipulating
Observing
Predicting

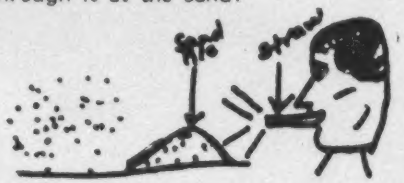
Concept

Wind is a powerful erosion force on the earth's surface.

ACTIVITY

How can wind wear down the surface of the earth?

Break students into small groups? Place newspapers over top of desks. Take some dry sand and make a small pile of sand. Give students a straw and have them slowly blow through it at the sand.



Discussion Questions

1. What happened as you blew on the sand? (Small particles of sand were removed from pile)
2. What would happen if you kept blowing? (Eventually the pile of sand would completely be worn away).
3. What are some of the factors that would effect the rate at which an object would be worn down (eroded)? (Amount of wind, kind of material-granite vs. sandstone, and materials being carried by the wind).

INFORMATION FOR TEACHERS

Materials Needed

straws
newspapers
sand

Note: Erosion is the wearing away of the earth's surface not only by water but by wind also.

After completing investigation teacher may want to take students outdoors to look for

OUTLINE CONNECTION

Activity Title

Weathering by temperature.

Concept

The surface of the earth can be broken down by water freezing and expanding.

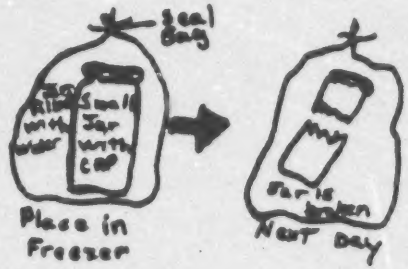
Skills

Using hypotheses
Generalizing
Observing
Predicting

ACTIVITY

Can rocks be broken down by freezing?

The day before activity, teacher should give class a very small jar and ask a student to fill it to the rim with water. Have another student come up and cap jar tightly. Then place jar in a plastic bag and seal it. Allow students to examine contents of bag. Teacher should then place the jar and bag in the freezer overnight. DO NOT TELL STUDENTS THAT YOU ARE GOING TO PUT IT IN FREEZER.



INFORMATION FOR TEACHERS

Materials Needed

small jar with lid
heavy duty plastic bag
tie for plastic bag

Note: Teacher may introduce concept of weathering to students. Weathering is the process of wearing away the surface of the earth not only by wind and water but also by heat, cold, and plants.

Extension

To demonstrate weathering by heat take and heat small grains of sand. The heat will cause them to expand making a popping noise. Relate this to expansion and contraction.

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
	Next day allow students to examine the bag and jar. Do not open the bag! Disucssion Questions 1. What do you observe? (That the glass is broken). 2. What might have caused the jar to break? (The water in the jar froze and expanded causing the jar to break). 3. In nature rocks are often broken by water freezing and then expanding. How can this happen? (Water seeps into cracks and crevices of rocks, freezing then expanding causing the rock to break).	

OUTLINE CONNECTION

Activity Title

Weathering by Plants

Concept

Plants are a powerful weathering agent.

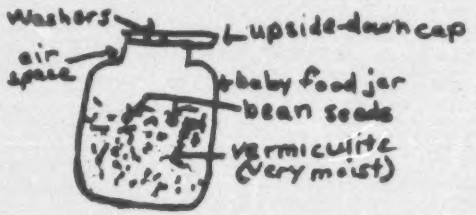
Skills

Creating model
Formulating hypotheses
Generalizing
Inferring
Observing
Manipulating
Observing
Predicting

ACTIVITY

Do plants have any lifting power?

Break class into small groups giving each group a baby food jar filled with moist vermiculite. Then place bean seeds, (lima, or any rapidly growing seeds) in vermiculite. Place cap up side down on jar. Give one group washer to place on cap, another group two washers and so on. As plant grows the top will be knocked off demonstrating the lifting power of seeds.



Have each group report to class the results of their investigation.

Discussion Questions

1. Now that we know that plants do have lifting power how could they change the surface of the earth? (As plants grow their roots break up soil and rock).

INFORMATION FOR TEACHERS

Materials Needed

bean seeds
vermiculite
baby food jar with lid
washers

Note: Examine lichens under a microscope. Discuss how lichens break down rock into soil. (Relate to other plants, such as moss on rocks, grass and weeds in sidewalks).

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
Activity Title Mans effect on the environment. Concepts Landscapes of the earth are shaped and changed by humans. Skills Formulating hypotheses Generalizing Inferring Predicting Making decisions Observing Classifying	How has man changed the surface of of the earth? Using the bulletin board or a large sheet of oaktag create a collage of all changes that students can find displaying how man has changed the surface of the earth. Discussion Questions 1. What are some of the changes man has made on the physical environment? 2. What changes in the physical environment. Do you see man making in the future?	Materials Needed oaktag (optional) Note: Teachers should allow students to search out those pictures they feel that display changes man has made. Do not go over changes man has made before lesson, allow them to decide for themselves.

Glossary

Carbon dioxide	-	gas in the air; formed by combining chemical substances.
Continental drift	-	idea that continents are moving.
Core	-	central part of the earth.
Crust	-	thin, solid, outer layer of the earth's crust.
Earthquake	-	sudden movement in the earth.
Erosion	-	wearing away of the earth's surface by water and wind.
Fault	-	place where the rocks along the sides of a crack move.
Folding	-	wavelike bending in rock layers of earth's crust.
Geologist	-	scientist who studies the history and structure of the earth's crust.
Lichen	-	a double plant consisting of a fungus and an alga living on bare rock.
Magma	-	red-hot melted rock under earth's surface.
Mantle	-	layer of rock beginning below the earth's crust.
Plate	-	large sections of the earth's crust.
Seismograph	-	device for recording earthquake waves.
Volcano	-	a mountain formed by hot materials escaping from the earth.
Weathering	-	breaking of rock into small pieces by wind, heat, water, and temperature.

U N I V E R S E

Grade 6

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Universe

Overview

Students will become aware of stars, constellations, and galaxies. All the space they exist in is called the Universe.

Major Concepts

1. Astronomy is the science that deals with the study of the universe.
2. Patterns of stars in the night sky are called constellations.
3. Stars differ in size, magnitude and color.
4. Galaxies are major systems containing millions of stars.
5. The distance across and between galaxies is measured in light years.
6. Galaxies are classified according to their shape.
7. Our solar system is located in the Milky Way galaxy.
8. The spectrum of a star reveals its composition.

Materials

soup bowls	pencils	black construction paper	alcohol burner
pepper	bean seeds	overhead projector	prisms
water	large spoon	newspaper horoscopes	salt
SVE study prints	jar	construction paper	copper sulfate
chalk	glue	constellation charts	BOCES film catalog
paper	picture wire	colored pencils	

OUTLINE CONNECTION

Activity Title

Astronomy is the study of the universe.

Skills

Discussing
Researching

ACTIVITY

What is astronomy?

What does an astronomer do?
What are some tools used by an astronomer?

Discuss the above questions with the class. Show pictures, films, filmstrip, video cassette or study prints on this topic.

Reports can be assigned on any of the astronomy topics below:

Andromeda	Rigel	Polaris
Betelgeuse	neutron star	optical telescope
Alpha Centuri	nova	spectroscope
Space shuttle	pulsar	observatory
Space stations	comets	Skylab
black hole	red giant	Galileo
nebula	white dwarf	radio telescope
NASA	Quasars	big bang theory
Sirius	Isaac Newton	Johannes Kepler
Robert Gooddard		Werner Von Braun

INFORMATION FOR TEACHERS

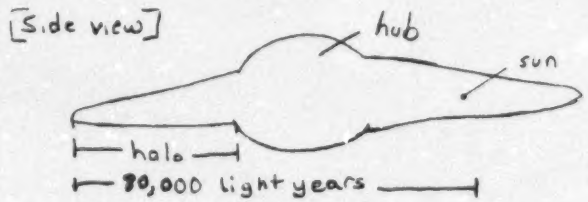
Materials Needed

A.V. materials from BOCES catalog

Oral Vocabulary

astronomy
telescope
radio telescopes
satellites

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
Activity Title Galaxies are classified according to their shapes. Our solar system is located in the Milky Way galaxy. Skills Manipulating Creating models Generalizing Observing	What is the shape of our galaxy? Divide students up into small groups. Provide each group with a soup bowl filled 3/4 with water. Sprinkle pepper in each bowl (2 or 3 shakes) Using a pencil, have the students stir their mixtures and observe the movement of the pepper. How would you describe the motion of your model of the galaxy? (spiral) What do you think each speck of pepper represents? (stars) What is happening in the center of of your bowl? (The pepper is collecting towards the center. In a galaxy, the stars collect toward the center of the galaxy called the hub). Where would you expect to find our sun? (One of the specks of pepper.)* Where would you expect to find the earth? (It would be invisible on the scale of our model.)	Materials Needed soup bowls pepper water Oral Vocabulary galaxy spiral hub halo *Any speck of pepper can be pointed out as our sun as long as it is not in the hub of the galaxy. Any speck in the spiral arms would be acceptable.

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
	Diagram a spiral galaxy on the blackboard. (Our Milky Way is a spiral galaxy.)  Point out to students that there are other shapes to galaxies besides spiral. Other shapes are elliptical and irregular. This would be a good place to show the students a film dealing with galaxies.	SVE study prints - pictures of galaxies Film: Cortland BOCES The Galaxies 832 209 Describes our galaxy, its rotation and the origin of stars. The similarities to be found between other galaxies and our own are discussed in detail.

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
Activity Title 1 light year = 6,000,000,000,000 miles Skills Using numbers	What is a light year? Point out to students that light travels 186,000 miles per second? How long do you think it would take light to travel completely around the earth once? Seven times? Count a second interval and tell the students that light traveled around the earth seven times in one second. How far will light travel in one minute? Have students multiply 186,000 miles/sec. times 60 seconds. Have one student show his work on the blackboard. How are will light travel in one hour? How can we figure this out? Have a student show the work on the blackboard. (_____ x 60 min.) How far will light travel in one day? How can we figure this out? Have students multiply out the answer and have one student show his work on the blackboard. (_____ x 24 hours)	Materials Needed chalk paper pencils Note: Light travels at 186,000 miles per second 300,000 km per second. Oral Vocabulary light year Light travels approximately: 11,160,000 miles (minute) 669,600,000 miles (hour) 16,070,400,000 miles (day) 5,865,696,000,000 miles (year) 1 light year equals approximately 6,000,000,000,000 miles

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
	How far does light travel in one year? How can we figure this out? Have students multiply out the answer and have one student show his work on the blackboard. (_____ x 365 days) Point out that this is one light year. Our Milky Way galaxy is 80,000 light years across. Do you think we will ever travel across our galaxy in your lifetime? Why not?	Milky Way Galaxy ≈ 480,000,000,000,000,000 miles

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
Activity Title Galaxies contain millions of stars.	How many stars are in a galaxy? On a clear night, how many stars do you think you can see? (2,500) Do you think you could count all the stars in the sky one by one? Why not? Point out to students that there are ways of estimating how many stars there are.	Materials Needed bean seeds large spoon jar
Skills Estimating Using numbers Inferring Manipulating	Estimating the number of stars by sampling 1. Fill a jar with bean seeds. 2. Take a spoonful of beans. 3. Count the number of beans. 4. Record the number of beans. 5. Put the beans back in the jar. 6. Take five such samples. 7. Find the average of the five samples. 8. Determine how many spoonful there are in the jar. 9. Multiply the number of spoonfuls in the jar by the average number of beans per spoonful. (This number will be your estimate.) 10. Count the beans to find out how accurate your estimate is.	Oral Vocabulary sampling estimating astronomers

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS

Your estimate is.

Sample Number	Number of beans
1	18
2	16
3	22
4	24
5	20
	100 (Total number of beans in sample.)

100 ÷ 5 = 20 (Average # beans/ sample)
10 Estimated # spoonfuls in the jar.
20 x 10 = 200 (Estimated # beans)
216 (Number of counted beans.)

Explain to students that astronomers use sampling to estimate the number of stars. Astronomers photograph the night sky in sections, count the number of stars in that section and multiply by the number of sections in the sky.
This same process has been used to figure out that galaxies are made up of millions to hundreds of billions of stars.

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
Activity Title Constellations are patterns of stars. Skills Creating models Manipulating Observing	How do stars form patterns in the sky? Distribute pictures or dittoes of various constellations and a sheet of black construction paper to each student. Using white chalk have the students draw a constellation of their choice. Then have students poke holes in the construction paper with their pencils (each hole representing a star.) When all the students have completed their constellations, darken the room and place the construction paper on the on the overhead projector. By projecting the students' constellation on the chalk board or a screen, it is then possible to connect the stars to further display the pattern of that constellation. What do we call groups of stars forming patterns in the sky? If you sat in a chair and star gazed and came back a month later and sat in the chair in the same place, would the stars be in the same position? Why or why not? (No, because the earth is rotating and your chair is moving along with it.)	Materials Needed constellation charts black construction paper white chalk overhead projector Oral Vocabulary constellation stars (names of some familiar constellations) Extension Students could make a seasonal star chart showing when the constellations can be found.

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
Activity Title Some people believe the position of the stars influences human behavior. Skills Research Discussing Formulating hypotheses Recording data Generalizing Interpreting data Making decisions Replicating	What is astrology? Bring in a newspaper and on the blackboard write the dates covered by each sign. Go over the pronunciation of each sign and read a few predictions. Ask - are these predictions necessarily going to come true? Point out that this is an inexact science that deals with intrepretations that cannot be proven right or wrong. There has been so much written concerning the subject that some people follow faithfully and plan their days and lives around, while others consider it fictitious. Have students use reference materials to find the sign in the Zodiacs that matches their birthdate and make a sketch of it. Find information concerning the origin of their particular sign and any other related facts. Have each student create an individual booklet for their sign that will include the following: A. Cover - picture of their sign and birthdate. B. Write a brief history of their sign. C. Keep a daily log for a week 1. Cut out and paste in the prediction from a newspaper for each day. 2. Relate their actual experiences to daily predictions. D. Share your findings each day.	Materials Needed several daily horoscopes from the paper construction paper glue colored pencils Oral Vocabulary astrology zodiac

OUTLINE CONNECTION

Activity Title

Stars are different in size, color and magnitude.

Skills

Observing
Discussing
Classifying
Interpreting data

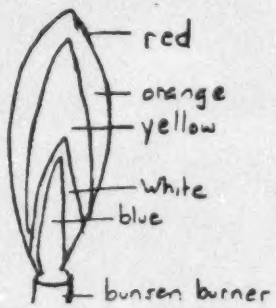
ACTIVITY

How are stars different?

Ask the students to think about the last time they saw something burn.

What colors did you see?

The teacher should light a can of sterno, an alcohol burner, a propane burner, or a bunsen burner. Observe the colors of the flame. Now draw a model of the "perfect" flame on the chalk board.



What part of the flame is the hottest? (blue) Coolest? (red)

Point out to students that stars are different temperatures.?

What does that mean about the of colors of stars? (They are different colors.)

INFORMATION FOR TEACHERS

Materials Needed

a source of flame
prism

Note: A candle may be used, however, you will not get a blue flame.

Oral Vocabulary

magnitude
(names of some stars)
spectroscope

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS

The following chart may be given to the class.

Star	Color	Temperature
Rigel	blue-white	12,000° c(21,632°F)
Sirius	white	10,500° c(18,932°F)
Sun	yellow	5,500° c(9,932°F)
Arcturus	orange	4,200° c (7,592°F)
Antares	red	3,000° c (5,432°F)

Which star is the hottest?
What color is it?
What star is the coolest?
What color is it?

Point out to students that starlight appears white to the human eye. In actuality it is a blend of several different colors. This can be demonstrated by shining sunlight through a prism.

Astronomers use a device called a spectroscope to determine the composition of a star.

Note: The magnitude of a star depends on its size, temperature, an distance from earth.

A spectroscope incorporates the prism and a telescope.

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
Activity Title The spectrum of a star reveals its composition. Skills Manipulating Observing Generalizing	How can the composition of a star be determined? Divide class into small groups giving each group a prism and a piece of white construction paper. Have the students move to where there is direct sunlight (by a window or outdoors.) Using the prism have the students try to get a spectrum of the sunlight on their white paper. What colors did you see on the paper? Where else have you noticed this band of colors before? Ask students to compare the spectra of other groups. Are the colors of the spectrum always in the same order? (yes) Intruduce ROY G. BIV as a way of remembering these colors and their order. Point out to students that the spectrum light from a star can also show what elements are on the star.	Materials Needed prisms white construction paper spoon alcohol burner (bunsen) salt copper sulfate picture wire Spectrum - ROY G. BIV (red, orange, yellow, green, blue, indigo, violet) Oral Vocabulary spectrum (spectra) prism indigo Film on Spectrum from BOCES Learning About Light 832-527

OUTLINE CONNECTION	ACTIVITY	INFORMATION FOR TEACHERS
	To demonstrate that different substances (elements) produce different colors teachers may use the flame test. Light a bunsen burner or alcohol burner. Next, wet the tip of a spoon with water. Dip the tip of the spoon into some sodium chloride (table of salt). Place the tip of the spoon over the flame. What is happening? (Color change in flame) What color is the flame? yellow, because of sodium) Burn some copper sulfate following the same procedure as above. What color is the flame? (green, because of copper) Burn a piece of picture wire. What color does it burn? (red, because of iron) What accounted for the different colors in our flame test? (Different elements that the substances were made of.) Why do you think each star has a different "color fingerprint" (spectra)? (Because stars are made of elements.)	Note: Our sun is made up of approximately 62 different elements. Hydrogen and helium are the most abundant elements.

Glossary

astrology	-	the study of the supposed influences of the stars and planets on human behavior.
astronomist	-	a scientist that studies astronomy.
astronomy	-	the science that deals with the study of the universe.
constellations	-	groups of stars that form patterns in the sky.
estimating	-	to determine roughly the size, extent or nature of.
galaxy	-	a family of millions of stars in space revolving around a center.
halo	-	the outer stars surrounding the hub of a galaxy.
hub	-	the center of a galaxy.
indigo	-	a blue-violet color in the spectrum.
light year	-	the distance light travels in one year.
magnitude	-	brightness of a star as seen from earth.
prism	-	a device such as a triangular piece of glass which spreads white light into its band of colors.
radio telescopes	-	a device that collects or sends radio waves into space.
satellite	-	an artificial object that revolves around an object in space.
spectroscope	-	a device used to analyze light from a glowing object to determine its composition.

spectrum - the rainbow of colors formed when light passes through a prism.

spiral - the shape of some galaxies.

telescope - a instrument used to look at heavenly bodies.

zodiac - an imaginary belt in the heavens that encompasses all the principal planets except Pluto. It is divided into twelve constellations.